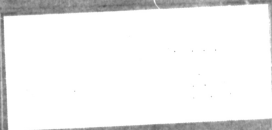


95-H-13
ANTOINE LAKE N.E.
SURFACE ELEVATIONS

DATE	DEC 1967	SCALE	2" = 1 MILE	INTERVIEWED BY	W. H. BOSTON
REVISED	JULY 29, 1968	DRAWN BY	A. A. A.	PLY NO.	5-194

216-6-4-3



Abstracted for
Geo-Science Data Index

Date _____

BANFF OIL LTD.



NORTHWEST TERRITORIES

REPORT ON A SEISMIC SURVEY BY REFLECTION METHOD

216-4-6-67-2

FORT SIMPSON AREA



ANTOINE LAKE

December 2, 1967 to February 10, 1968

Abstracted for
Geo-Science Data Index

Date _____

COMPAGNIE GENERALE DE GEOPHYSIQUE

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FOREWORD

Party S. 904 of COMPAGNIE GENERALE DE GEOPHYSIQUE carried out, on behalf of BANFF OIL LTD., a reflection seismic survey in the ANTOINE LAKE area, Northwest Territories.

Access and seismic line opening was sub-contracted to BOREK CONSTRUCTION LTD., and to LEE'S CONSTRUCTION LTD.

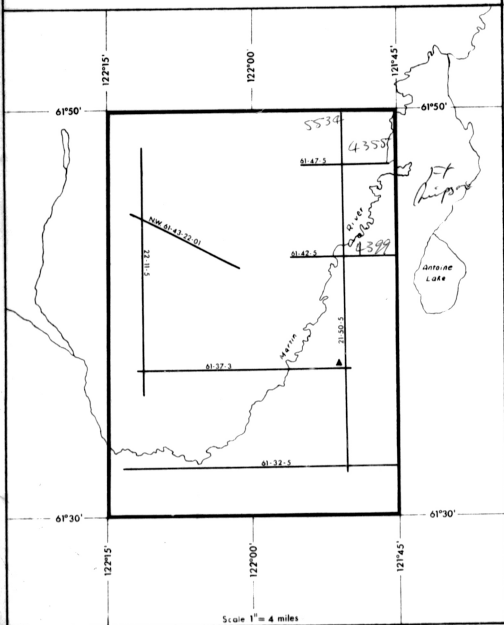
Shot hole drilling was sub-contracted to SHELLEY DRILLING LTD., TOWN & COUNTRY WATER WELL BORING LTD., CAM CORD DRILLING LTD., ABLE DRILLING CO LTD., and E. WARD DRILLING CO LTD.

The seismic camp was rented from ATCO INDUSTRIES LTD., and catered by FORTIER & ASSOCIATES SERVICES LTD.

The survey was performed between December 2, 1967 and February 10, 1968, according to the terms of the agreement signed December 1, 1967, by BANFF OIL LTD., and COMPAGNIE GENERALE DE GEOPHYSIQUE.

The Party, headed by C. EIZLINI, Party Chief, and L. LERIGER, Party Manager, was supervised by M. EIDSNESS.

ANTOINE LAKE



CHAPTER I

GENERAL INFORMATION

1.1 Project Location (Figure 1)

The program was located southwest of Fort Simpson, (N.W.T.), in an area located between $61^{\circ}30'$ and $61^{\circ}50'$ latitude north, and $121^{\circ}45'$ and $122^{\circ}15'$ longitude west.

1.2 Seismic Program

The project was located in an area where practically no geological or geophysical features were known. The survey was, therefore, a reconnaissance seismic survey.

The initial program consisted of 79 miles of seismic line to be shot with 300% C.D.P. technique.

Various field difficulties, such as floating muskeg areas and very steep hills (Martin hills), made it necessary to delete parts of some programmed lines. Other lines were extended in order to attain the required mileage of 79 miles.

1.3 Gravity Program

One gravity reading was to be taken at every seismic shot point; the entire program had then to be tied to the Hudson Bay - Amerada Cam-sell A-37 well.

216-4-6-67-2

PARTY COMPOSITION

ANTOINE LAKE

PERSONNEL

CALGARY	FIELD
<u>SEISMIC</u> 1 Party Chief 1 Chief Computer 1 Computer	<u>SEISMIC</u> 1 Party Manager <u>BULLDOZING</u> 6 Operators 1 Senior Observer 1 Junior Observer <u>CATERING</u> 2 Cooks 1 Surveyor 1 Cook's helper 1 Shooter 1 Camp Attendant 8 Helpers <u>DRILLING</u> 1500 GAL. WATER TRUCK 10 Drillers 4 drivers 10 Helpers

ADDITIONAL One gravimeter operator from January 29 to February 3.
 One gravimeter operator and one surveyor from March 21 to April 3.

EQUIPMENT

TECHNICAL	VEHICLES	DRILLING & DOZING
1 PT 100 Amplifier Set 1 PMR 20 Magnetic Recorder 1 VTO 6 Oscillograph 1 Remote Control Firing System 12 Six Take-out Cables (25-pairs) 2-200 foot jumpers 540 - 28 cycle EVS 2 geoph. 2 EVS-5A geophones 6 Trans Receivers	1968 GMC 3/4 T, 4x4 1 Party Manager Unit 1 Surveyor Unit 1 Recorder Unit 1 Shooter Unit 2 Cable Units	<u>DRILLING</u> 1 Rotary Mayhew 1000 1 - 800 Gal. water truck 4 Top Drives 5 Pick Ups 1 Electrical Welding Unit 2 1500 gal. water trucks <u>DOZING</u> 3 D7E Units 1 Trailer camp.

ADDITIONAL One 1968 GMC 3/4 4x4 from January 27 to February 10.
 Two 1968 GMC 3/4 4x4 from March 21 to April 3.

MISCELLANEOUS

CAMP

2 1000 gallon fuel tanks
 1 Propane tank
 1 Mobile Explosive Storage
 1 Mobile Detonator Storage

1 Kitchen
 1 Diner
 1 Wash Car
 2 Sixteen Man Sleepers
 1 Fourteen Man Office Sleeper
 1 30 KVA Generator
 1 7 KVA Generator

ADDITIONAL One gravimeter Worden Master No. 570 from January 29 to February 10.
 One Sharpe No. 133 from March 21 to April 3.

CHAPTER II

PERFORMANCE

2.1 Party Composition (Figure 2)

The composition of the crew, personnel and equipment, is shown on Figure 2. COMPAGNIE GENERALE DE GEOPHYSIQUE provided recording, surveying and additional gravity equipments.

Five drilling rigs were used; one conventional with an 800 gallon water truck, and four top drive rigs which were reduced to three from January 22. Two additional 1500 gallon water trucks supplied drilling and camp water.

Bulldozing equipment consisted of three D7E units and one mobile camp.

Drilling and bulldozing equipment was operated on a double shift basis.

The seismic camp was composed of six trailers and powered by a 30 KVA power plant. An additional smaller stand-by unit was also used for electrical welding.

In addition to the basic equipment mentioned in Figure 2, the following equipment was added:

- two blasters - SIE SCD 2000 BA.
- one oscilloscope and one signal generator.
- four battery chargers.
- three detonator testing galvanometers.
- two line testers.

BANFF OIL Ltd.

ANTOINE LAKE

		JANUARY	FEBRUARY	TOTAL	
DOZING hours	Access (December,1967)	280		280	
	Line cutting	908	495	1,403	
	Total	1,188	495	1,683	
DRILLING	Holes	922	482	1,404	
	Shot Points	315	165	480	
	Footage	45,897	24,730	70,627	
	Field Hours	1,090	637½	1,727½	
	Driving hours	229	221	450	
	Total Hours	1,319	858½	2,177½	
	Feet/field hour	43.9	38.8	40.9	
	1500 gal. water trucks	636	372	1,008	
RECORDING	Shot Points	255	225	480	
	Miles	44.374	36.500	80.874	
	Field hours	108½	82	190½	
	Driving hours	23½	28½	52	
	Total hours	132	110½	242½	
	SP/field hour	2.35	2.74	2.52	
	Miles/10-hour-day	3.361	3.303	3.335	
CONSUMPTIONS	RECORDING PRODUCTS	Magnetic Tapes	260	228	488
		Photo paper	17	15	32
		Photo products	22	16	38
		Explosives lbs.	6,078	6,600	12,678
		Blasting caps	733	651	1,384
	DRILLING PRODUCTS	Mud lbs	2,150	1,600	3,750
		Bran lbs	1,350	850	2,200
		Insert bits	192	98	290
		Rock bits	69	33	102

- one set of binoculars and two compasses.
- one Wild To Theodolite and two rods.

2.2 Chronology

Opening of the access road from Fort Simpson and of most of line 61-37-3 began at the beginning of December, 1967, by units of BOREK CONSTRUCTION LTD.

LEE'S CONSTRUCTION LTD.'S three D7E's walked into the area and started line cutting on January 16, 1968.

The seismic camp which was moved north from Rainbow on January 17, was located at approximately 61°37' latitude north and 121°50' longitude west, near the intersection of lines 61-37-3 (Priority No. 1) and 21-50-5 (Priority No. 2) on January 19.

Drilling commenced on January 20, and recording on January 21.

Bulldozing and drilling were completed on February 9, and recording on February 10.

In March, the surveyor and the gravity meter operator returned to the area where they worked until April 3, 1968.

The entire crew was then moved north to the HIGHLAND LAKE area.

2.3 Statistics (Figure 3)

A monthly break-down of production and consumption figures appears in Figure 3.

23.1 Production

Bulldozing:

The access road was opened in December by wide pad D6C units

WORKING CONDITIONS

ANTOINE LAKE

LOCATION	CAMP	Southwest of Fort Simpson, NWT.
	SITE	61°37' latitude North; 121°50' longitude west.
	COMMUNICATIONS	By FWA planes, twice weekly, Edmonton - Fort Simpson. By road from Fort Simpson. By radio-telephone, through Hay River mobile. By mail
	WEATHER	Sub-Arctic continental climate.
PERSONNEL		<u>Helpers</u> : contracted in Calgary <u>Organization of work</u> : Continuous 7 days a week. Recording crews working one shift. Bulldozers and drilling rigs working two shifts a day.
SUPPLIES	WATER	From the Martin River by water trucks
	FOOD	Fresh, tinned and frozen foods sent weekly from High Level by Fortier trucks.
	PROPANE	From Fort Simpson.
	BITS	From CANADIAN OIL TOOL LTD., WALKER-McDONALD BIT DISTRIBUTORS LTD., NELSON BIT SERVICE CO. LTD., by travelling salesmen.
	MUD	From EXPLOSIVES LTD., Fort Simpson, by their own truck.
	FUEL & LUBR	From IMPERIAL OIL LTD., Fort Simpson, by their own truck.
	EXPLOS & DETON	From EXPLOSIVES LTD., Fort Simpson, by their own truck.
	TAPES	SIE FM tapes, from DALCAN EQUIPMENT, Calgary
	PHOTO	KODAK chemicals, from SIE, Calgary.
PRODUCTS		

in 280 hours.

A total of 1403 hours was necessary for three D7E units to cut the assigned program.

Drilling:

The average production was 40.9 feet per field hour. Night shift production kept within 70% - 85% of day shift production. A total of 70,627 feet was drilled.

Recording:

The entire program was recorded in 300% CDP. The average production was 2.52 shot points per field hour. A total of 80.874 miles was recorded in 242½ hours including driving time. The average 10-hour-day production was 3.335 miles.

23.2 Consumption

Rolls of 150 feet of photo paper were used. One unit of photo products consists of one gallon of developer and one gallon of fixer.

The average mud consumption was 53 pounds of gel and 31 pounds of bran per 1000 feet drilled.

The average bit consumption was 4.1 insert bits and 1.5 rock bits per 1000 feet drilled.

2.4 Working Conditions (Figure 4)

Temperatures usually remained within a -30° to 0° range. However, they dropped considerably for about a week at the beginning of February, and the recorded lows remained around -65° to -60°.

SURVEYING

ANTOINE LAKE

REFERENCE DOCUMENTS	Program map, Scale: 2 inches = 1 mile. Topo. map, Scale: 1 inch = 4 miles; Sheets 95G (Sibbeston Lake) and 95H (Fort Simpson)																																				
PROJECTION SYSTEM	Conic Projection, UTM system, for NWT, from Clarke's Ellipsoid 1866																																				
REFERENCE DATA	Well Hudson Bay Amerada Camshell A-37 Fort Simpson Gravity Bases.																																				
MAGNETIC DECLINATION	<p>Eight sun observations were made throughout the study. The instrument magnetic declinations varied between 32°49' West and 33°42' West.</p> <p>Values of the declination for topographic computation were interpolated between two measures.</p> <table border="1" data-bbox="202 701 854 800"> <thead> <tr> <th>No.</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr> </thead> <tbody> <tr> <td>Date</td><td>Jan 20</td><td>Jan 24</td><td>Jan 26</td><td>Jan 29</td><td>Feb 5</td><td>Feb 6</td><td>Mar 31</td><td>Apr 1</td></tr> <tr> <td>Location</td><td>SP 1</td><td>Jan E Camp</td><td>SP 210</td><td>SP 295</td><td>SP 364</td><td>SP 391</td><td>SP 5 Airstn</td><td>A 37 well</td></tr> <tr> <td>Instr. Declin.</td><td>33°13'</td><td>33°04'</td><td>33°42'</td><td>33°20'</td><td>32°53'</td><td>33°07'</td><td>32°49'</td><td>33°37'</td></tr> </tbody> </table>	No.	1	2	3	4	5	6	7	8	Date	Jan 20	Jan 24	Jan 26	Jan 29	Feb 5	Feb 6	Mar 31	Apr 1	Location	SP 1	Jan E Camp	SP 210	SP 295	SP 364	SP 391	SP 5 Airstn	A 37 well	Instr. Declin.	33°13'	33°04'	33°42'	33°20'	32°53'	33°07'	32°49'	33°37'
No.	1	2	3	4	5	6	7	8																													
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Location	SP 1	Jan E Camp	SP 210	SP 295	SP 364	SP 391	SP 5 Airstn	A 37 well																													
Instr. Declin.	33°13'	33°04'	33°42'	33°20'	32°53'	33°07'	32°49'	33°37'																													
CLOSURES	ELEVATION There was no closed loop in the whole program. No elevation misclosure could therefore be observed.																																				
	PLANIMETRY No planimetry misclosure was observed.																																				
LOCATION MAP	Drawn by BANFF OIL LTD.																																				

The two commercial flights per week, always overloaded, could not be depended upon to supply the crew. Therefore, lighter items were sent by mail and heavier items by transport, the latter taking 7 - 10 days to reach Fort Simpson, (N.W.T.).

Radio-telephone contact was satisfactory.

Replacement personnel were impossible to contract in Fort Simpson, and had to be sent from Calgary.

2.5 Technical Conditions

25.1 Bulldozing

The main source of difficulty was the existence of very soft muskeg zones, in the eastern part of the project. Numerous detours had to be cut on line 21-50-5.

The high grounds of the north-western part of the area, covered with heavy timber, did not present special bulldozing problems.

All seismic lines of the program were tied together and no other access had to be cut.

Three D7E units, working double shift, were necessary to keep drilling and recording crews working.

25.2 Surveying (Figure 5)

References used were coordinates of the Hudson Bay Amerada Camsell A-37 well, and gravity base 9056-67, in Fort-Simpson, (N.W.T.).

The survey was tied to both these references; computation of shot point coordinates and location map plotting revealed a 3000 foot mistie with the well. There was no mistie with the gravity base.

Magnetic declinations of the instrument, a Wild To theodolite, was measured in six different locations. It was found to vary between $32^{\circ}51'$ and $34^{\circ}40'$.

RECORDING

ANTOINE LAKE

RECORDING SYSTEM	SIE PMR 20 Magnetic Recorder SIE VTO 6 Oscillograph
CHARACTERISTICS OF AMPLIFIERS	SIE PT 100 Amplifier Set Automatic Gain Control (fast) was used. Programmed gain unit remained off.
CABLES	From MARK PRODUCTS LTD., Calgary, twelve 4 Take-Out cables, 25 pairs, 230' between take-outs; Cannon 50 pin plugs. Two 200 foot jumpers. Eleven back to back jumpers.
GEOPHONES	From MARK PRODUCTS LTD., Calgary: 540 EVS-2 28 cycle geophones in strings of 9. 2 EVS-5A 28 cycle up-hole geophones.
PERIODIC TESTS	Head alignment: Daily Shake bridle: Daily Geophones: Weekly
SPREAD	Split spreads, 300% recording. 220 feet between groups; shot point between groups 12 & 13. One each group, 9 geophones over 220 feet.
SHOT POINT	One shot point every 4th group. Spacing between shot points: 880 feet. Three holes in line, 50 feet apart. Depth: 50 feet. Charge: 3 x 10 lbs.
RADIO	One Trans Receiver on each truck. One MANOREL RCF-2 remote control firing system set
INSTRUMENT SETTINGS	AGC fast - Filters 20 - 100 Initial Master Gain: -10 to -40 db.

Each shot point surveyed was identified by a tag bearing its number and the permit number, and nailed to the nearest tree.

25.3 Drilling

Except for the first two days of the survey, where an additional top drive rig was used, the drill power consisted of three top drives and one conventional rig with an 800 gallon water truck. Drilling and camp water was hauled by two 1500 gallon water trucks.

Hard drilling was often encountered (gravel and hard formations) causing a high bit consumption.

Initially, three 50 foot shot holes, preloaded with a charge of 5 pounds per hole were drilled at every shot point. In areas of poor energy return this preloaded charge was increased to 30 pounds.

25.4 Recording (Figure 6)

The program was recorded in 300% CDP. Group spacing was 220 feet, and shot point spacing was 880 feet. Twenty four trace split-spreads were recorded with the shot point between groups 12 and 13.

An SIE PT100 set of amplifiers was used in conjunction with a PMR 20 magnetic recorder and a VRO 6 oscillograph.

An SIE test tape was used to carry out daily head alignment tests, after which a shake bridle was recorded.

At each shot point a monitor record was taken and every sixth or eighth field tape was played back.

A Mandrell RCF-2 remote control firing system allowed the recorder to move every eighth or ninth shot. Time-break and up-hole signals were radio-transmitted to the amplifiers.

25.5 Gravity Reading

Between January 29, and February 2, the gravimeter Worden Master No. 570, after stabilization to the low temperatures, was used to take 65 readings. No base was set at this time, so, after a two hour program, a second reciprocal reading was taken at every station.

Gravity work was stopped on February 3 when the vacuum valve of the instrument was damaged, causing abnormal drifts.

Another gravimeter, the Sharpe No. 133, was used to complete the gravity readings in the area, between March 21 and April 3.

A net of 23 base stations was set in the Antoine area by "looping" (1). A gravity value was taken at the Fort Simpson main airport base 9056-67 (G = 981993.62; Lat. = 61°45'.4N; Long. = 121°13'.8W; Elev. = 573 feet), and carried to SP 108 base station by means of an additional five base stations looped together.

The small dial constants computed for both gravimeters are:

K = 0.9531 for the Worden Master No. 570
K = 1.1000 for the Sharpe No. 133

Except for the base setting where they did not exceed 20 minutes, the reading programs lasted 2 hours.

A total of 470 stations were measured; 21 of them were measured a second time to determine the average quadratic error in the readings.

- (1) An observation is made at Station 1, then ahead to Station 2, then looping back to 1 and on to 2 again, ahead to Station 3, looping back to 2 and on to 3 again, etc.

CHAPTER III

RESULTS

3.1 Field Results - Experiments

After examination of seismic data recorded in neighboring areas, where shot point parameters were found to be different from one area to another, the initial shot point pattern for the ANTOINE LAKE program was defined as follows:

Three 30 foot holes in line, 50 feet apart, and preloaded with 5 pounds each.

Line 61-37-3 (Priority No. 1) was recorded with these parameters. Quality of the results varied from poor to good. However, in order to prevent a fast loss of reflected energy in poorer areas, the preloaded charge was doubled to 30 pounds per shot point.

On line 21-50-5 (Priority No. 2) quality became extremely poor in several areas where the surface was generally soft muskeg. Plotting of first breaks showed a significant deepening of the 12,000 feet per second refraction marker. The weathered zone, more difficult to plot, is probably thicker, and may be absorbing seismic energy.

Six hole patterns, and charges increased to 75 pounds, did not improve noticeably the record quality.

On February 10, experimental spreads were recorded at shot points G-45/G-50, line 61-37-3 (Priority No. 1), for comparison studies using a 600% coverage.

3.2 Seismic Computation

All of the tapes were processed by Banff Oil Computer Systems.

All necessary corrections and data preparation were computed by C.G.G. in Banff Oil Geophysical Department offices for 3 to 1 stacked sections, flattened at the Hume, at .4 second.

The procedures were as follows:

- Field monitors were used for computation of the velocity function.
- The first play-outs, with NMO corrections only, allowed picking of the statics for a Hume flattening, and checking the NMO functions to which a vernier would be applied, when necessary.
- A second, and sometimes a third play-out, with NMO and static corrections, was used to trim the statics before the final stack.

As the maximum amplitude of the Hume reflection was a peak on the field records, polarity was reversed during transcription onto digital tapes. Therefore, the final sections show a reversed polarity when compared to the monitors.

3.3 Gravity Computation

Bouguer anomaly calculations were made using the formula:

$$A = G + CZ - G_0 + T$$

A = Bouguer anomaly

G = Gravity reading

CZ = Elevation correction, in which:

$$C = 0.09406 - (0.01276 \times \text{density}),$$

Z = station elevation

G_0 = Latitude correction, calculated from:

$$G_0 = 978.049 (1 + 0.0052884 \sin^2 Y - 0.0000059 \sin^2 2Y),$$

where Y is the station latitude.

T = Terrain correction.

The Bouguer contour is shown on Enclosure 1.

33.1 - Accuracy of the Results

Term G: Tidal effects were accounted for in the computation of the gravity programs. Double measures at 21 stations enabled the calculation of the average quadratic error on G:

$$e_g = 0.06 \text{ milligal}$$

Term CZ: The density was chosen from Nettleton profiles (Enclosure 2). Elevations Z are seismic elevations with a one foot accuracy.

The average quadratic error on the term CZ is:

$$e_{cz} = 0.06 \text{ milligal}$$

Term G: These were read from the location map, scale 2 inches to one mile; at this scale, a 1 millimeter error represents a 0.02 milligal imprecision. Therefore:

$$e_{go} = 0.01 \text{ milligal}$$

Term T: Terrain corrections were made with Hammer charts.

- Zones A to D (0 to 558 feet): correction made by the operator in the field.
- Zones E to H (558 to 8,578 feet): for these, the 1/250,000 topo maps were blown up to a larger scale (2 inches = 1 mile); there is an important imprecision on the contours that may lead to a 0.2 milligal error in hilly areas.

- Zones I to M (8,578 to 71,996 feet): Mr. NEUMANN standard parabola method (GEOPHYSICAL PROSPECTING, Vol. XI, No. 4, 1963) was used for these long distance corrections.

The total terrain average quadratic error may be evaluated at:

$$e_t = 0.30 \text{ milligal}$$

The average quadratic error on Bouguer anomaly is:

$$e_A = \sqrt{e_g^2 + e_{cz}^2 + e_{go}^2 + e_t^2} = 0.31 \text{ milligal}$$

CONCLUSION

The survey lasted 22 days, from January 20, 1968, date of the first drilling, to February 10, 1968, date of the last shot. An additional 280 hours were necessary in December, 1967, to open the access road into the area.

For this reconnaissance survey, 80.874 miles of seismic line were recorded in 300% coverage in a total of $190\frac{1}{2}$ field hours. A total of 70,627 feet was drilled in $1,727\frac{1}{4}$ field hours. It took 19 days to measure gravity at 470 stations.

Working conditions were difficult due to the remoteness of the area.

Three bulldozers, working double shift, were necessary to keep all drilling rigs operating 24 hours a day.

Average production was 40.9 feet drilled, and 2.52 shot points recorded per field hour.

Record quality varied from good to very poor in soft muskeg areas. Corrections were computed for both flattened sections (on the Hume) and structural sections. Field tapes were processed by BANFF OIL LTD.

Bouguer anomaly was computed and contoured with a density of 2.0.

Calgary, May 31, 1968.

L. FRION
Canadian Branch Manager

C. EIZLINI
Party Chief

ENCL. 2
G. 904

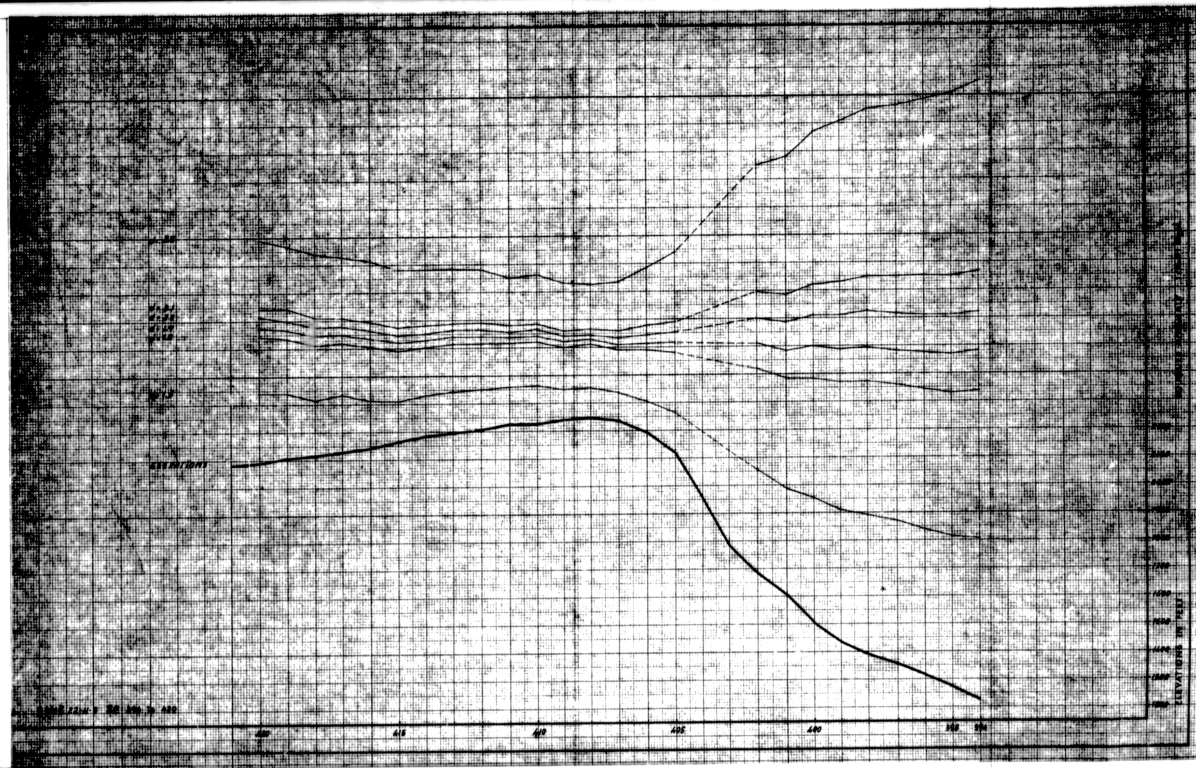
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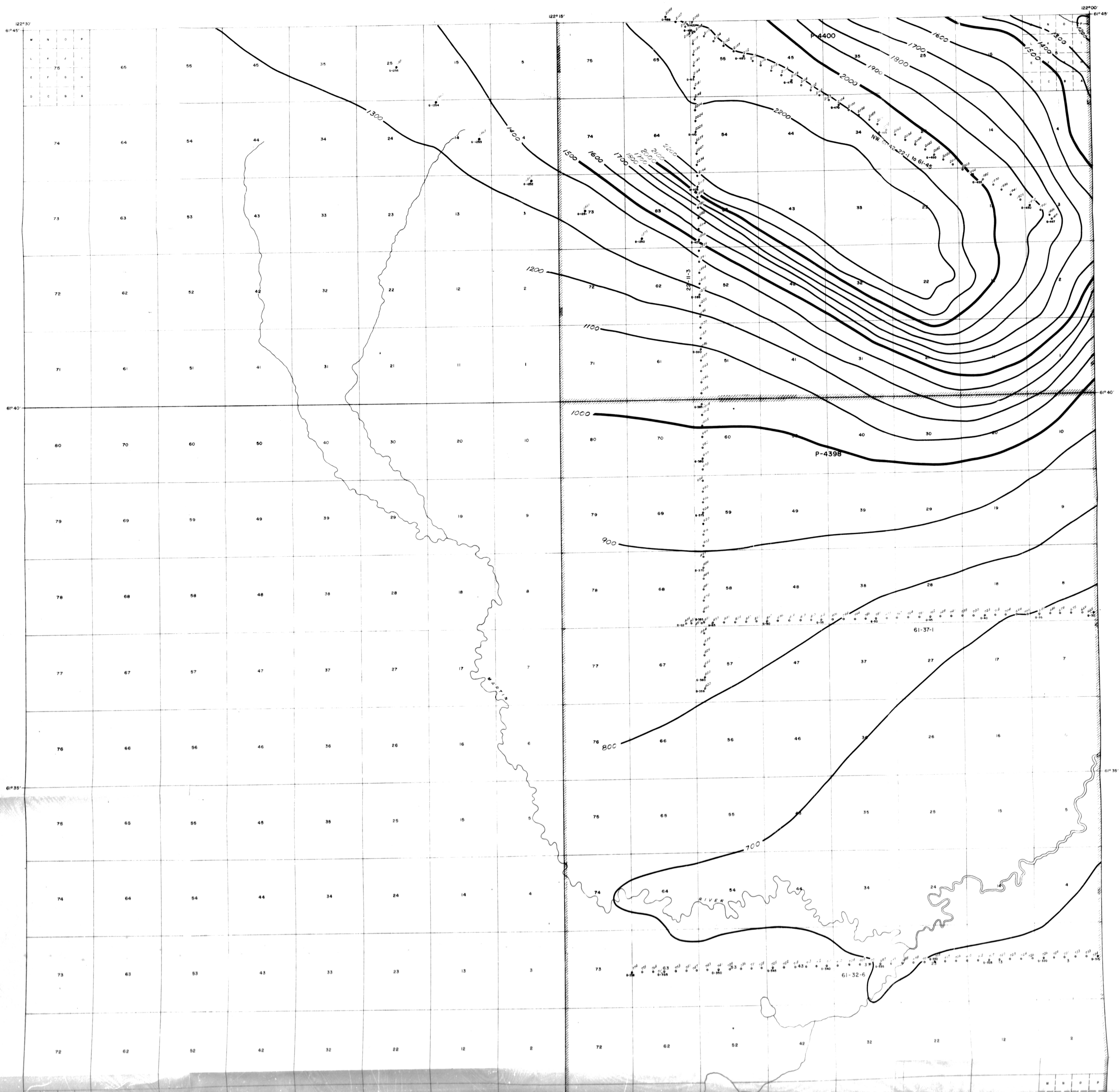
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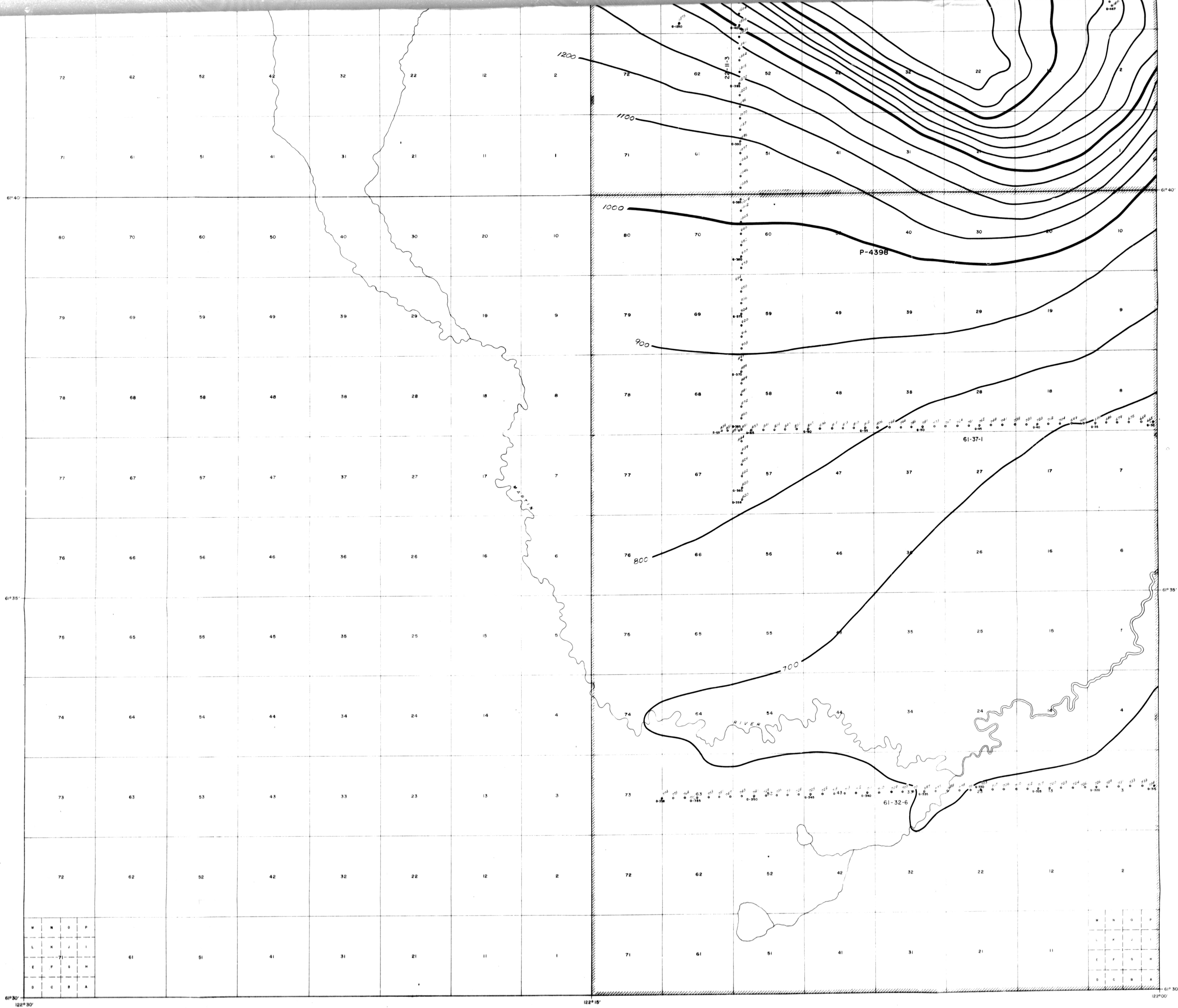
ANTOINE LAKE

DENSITY PROFILE

COMPAGNIE GENERALE DE GEOPHYSIQUE

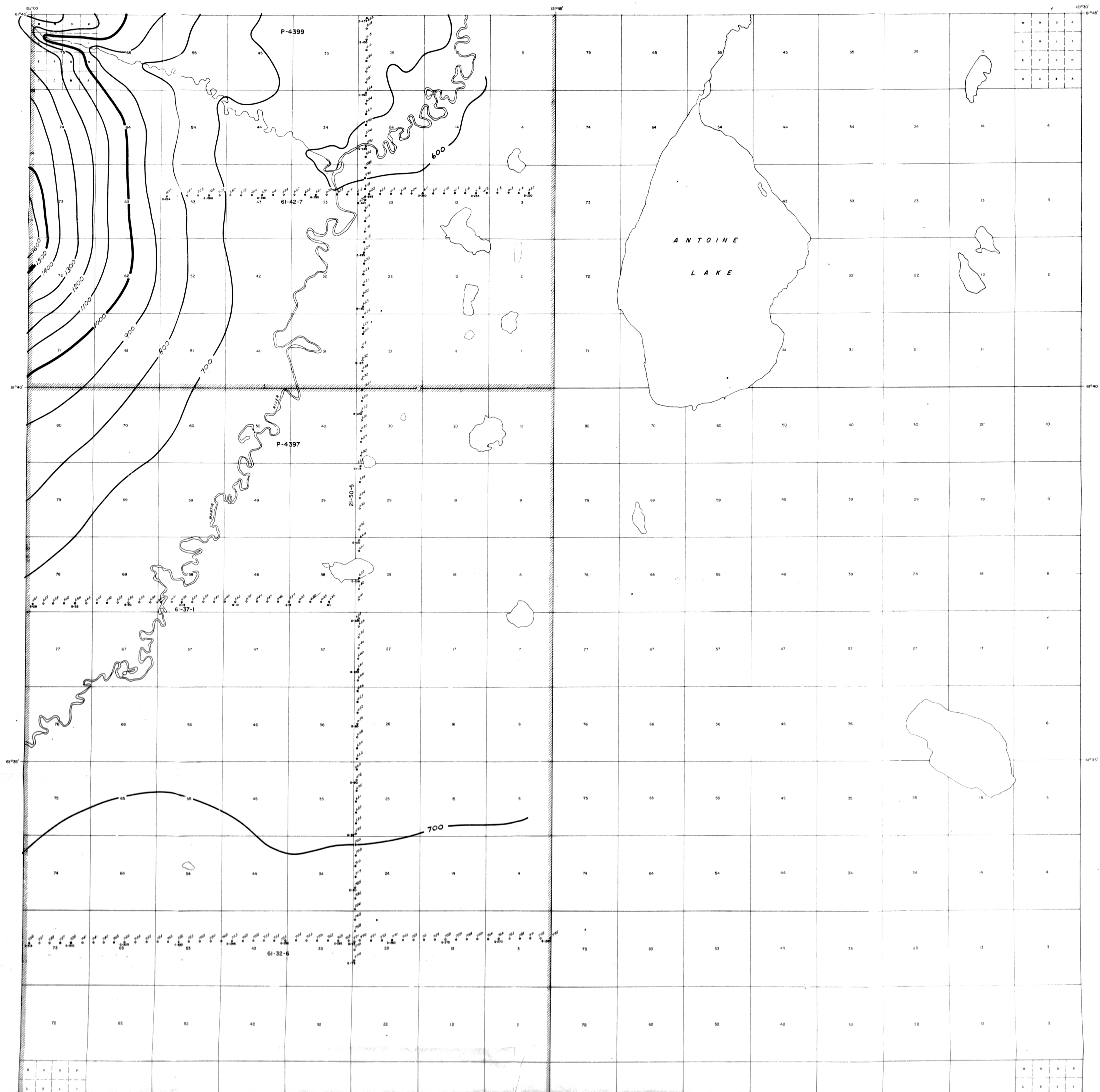


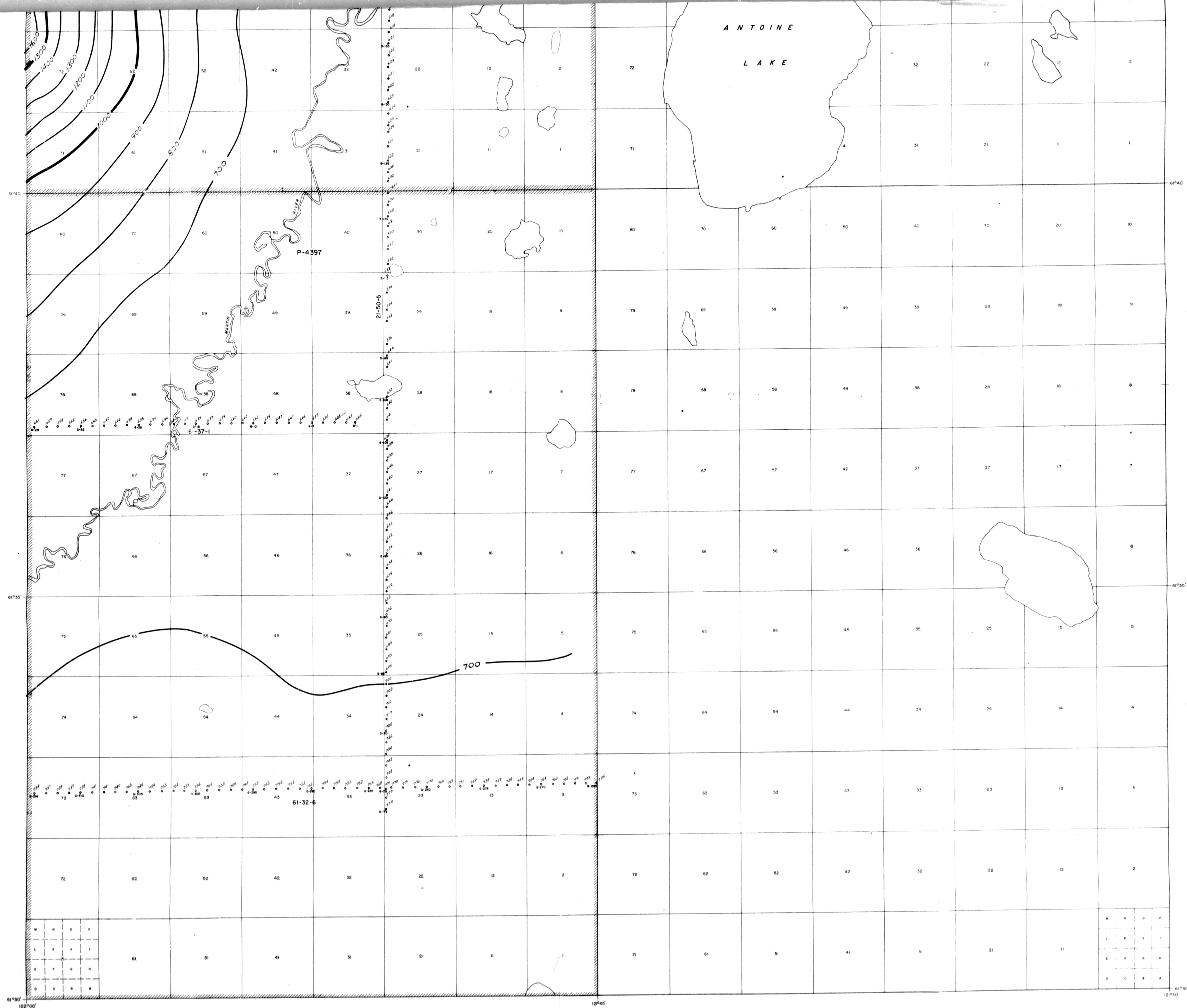




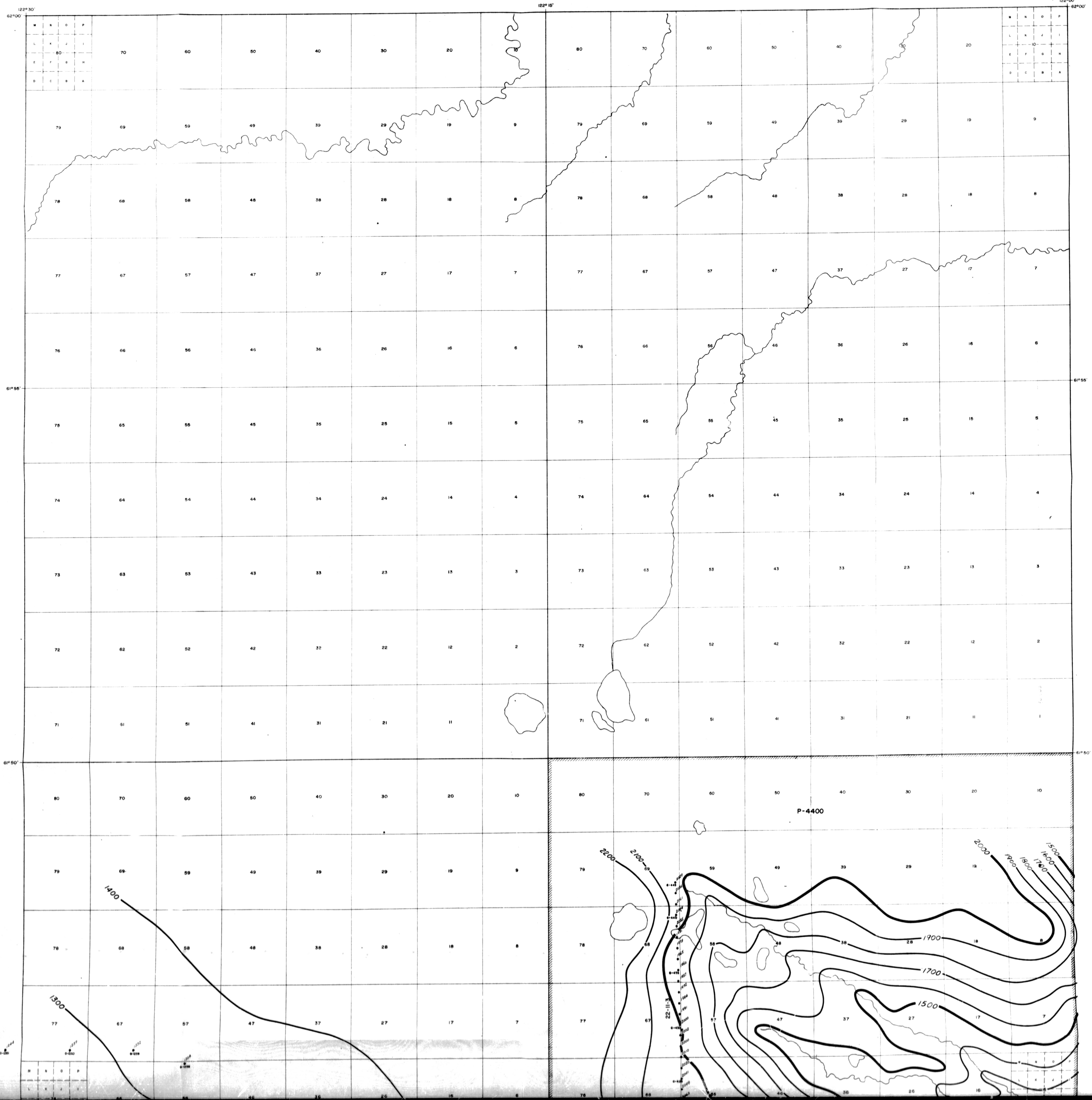
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ANTOINE LAKE S.W.
SURFACE ELEVATIONS

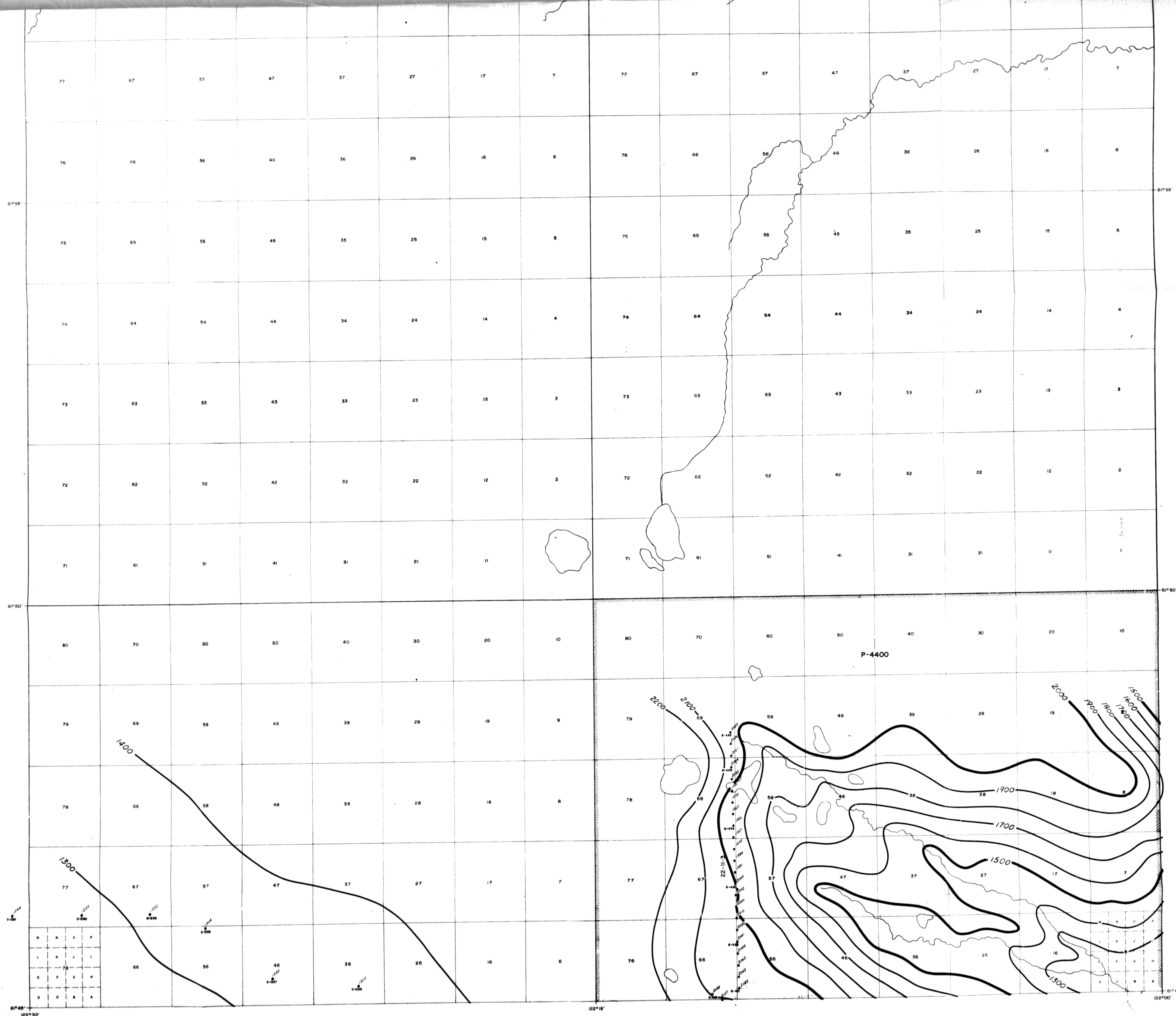
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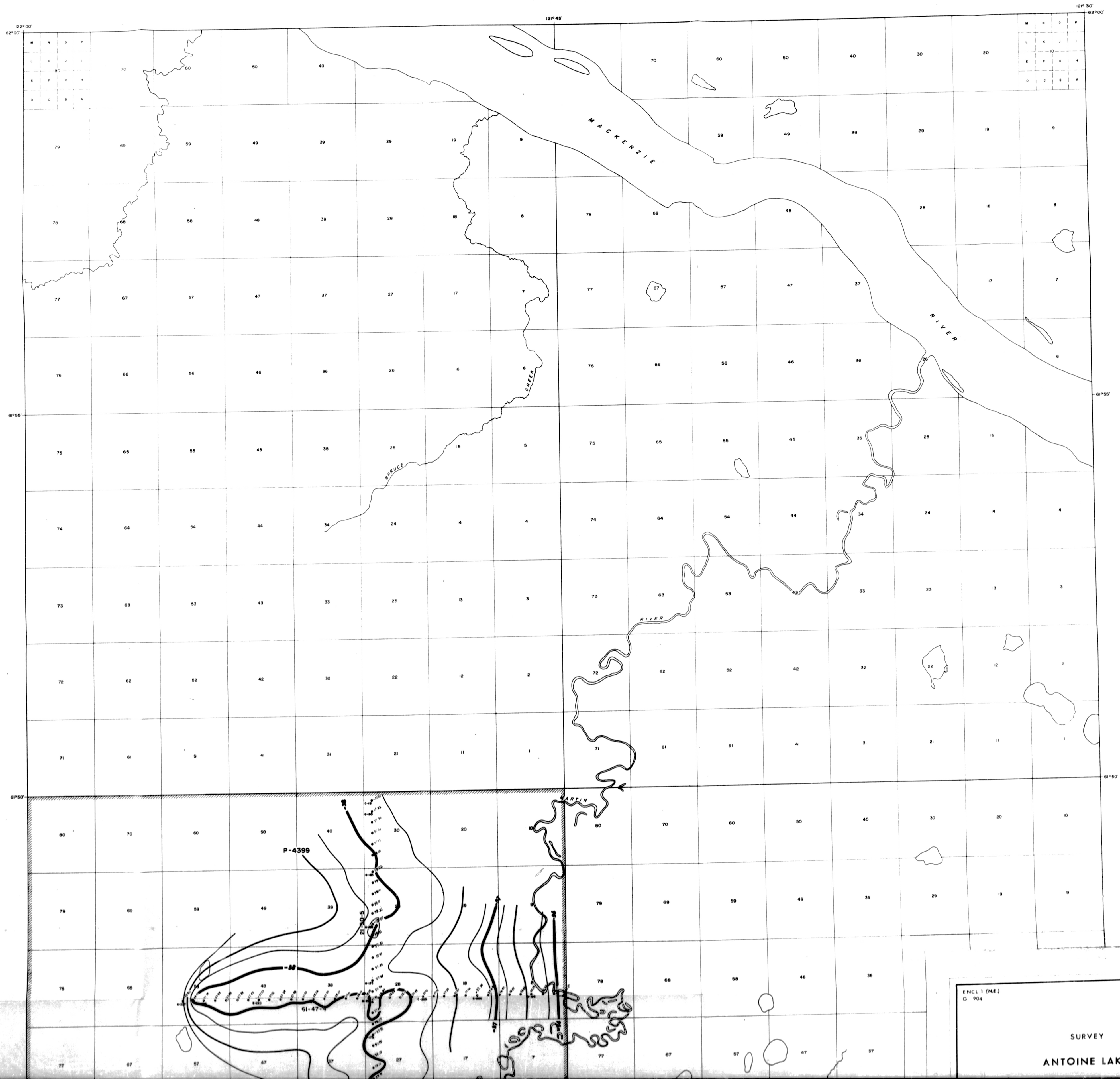
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ANTOINE LAKE N.W.
SURFACE ELEVATIONS

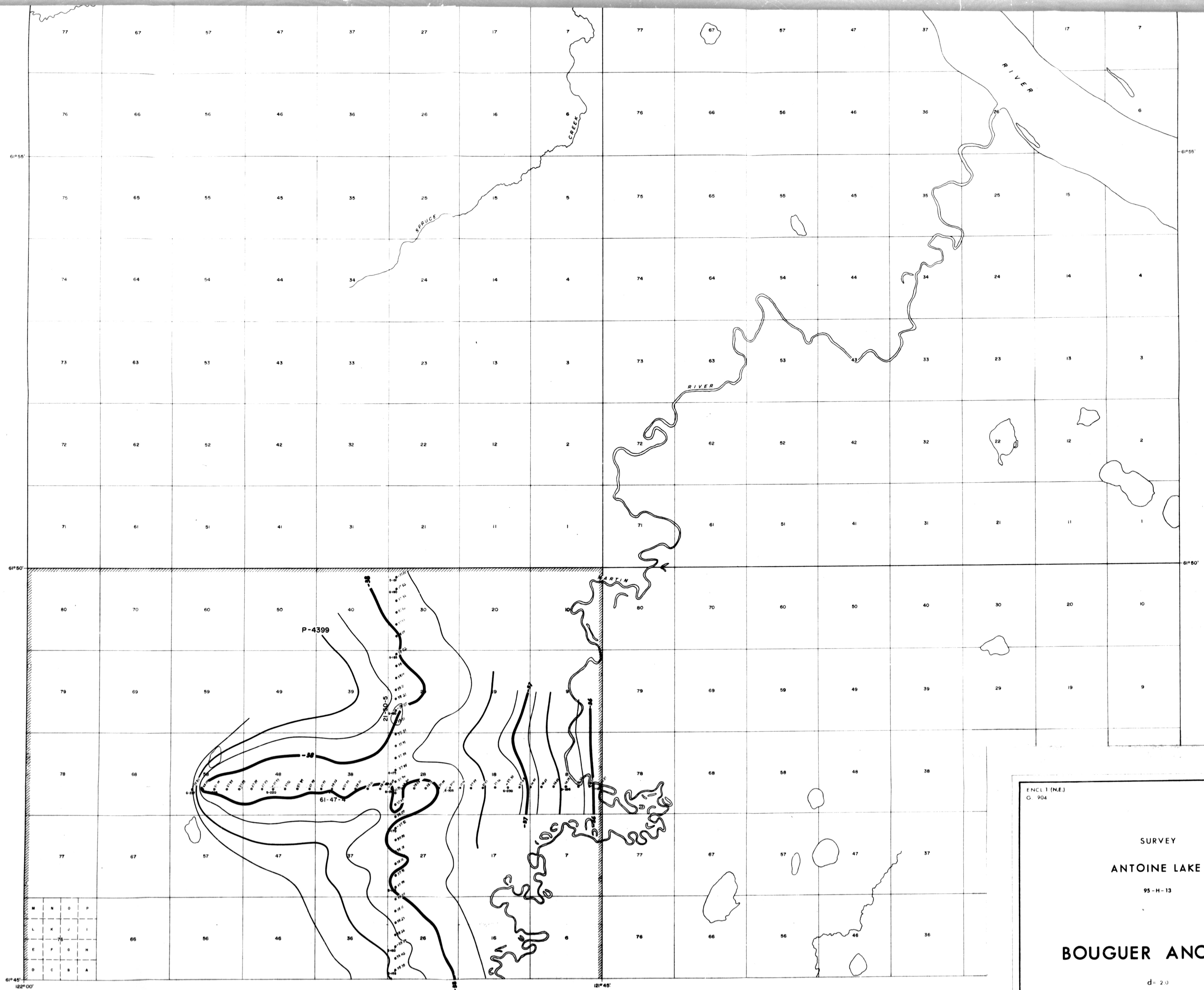
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REVISION	JULY 29, 1968	DRAWN BY	AAA	CHECKED BY	S. 95



ENCL 1 (N.E.)
G. 904

BANFF OIL LTD.

SURVEY
ANTOINE LAKE



ENCL 1 (N.E.)
G. 904

BANFF OIL LTD.

SURVEY
ANTOINE LAKE
95-H-13

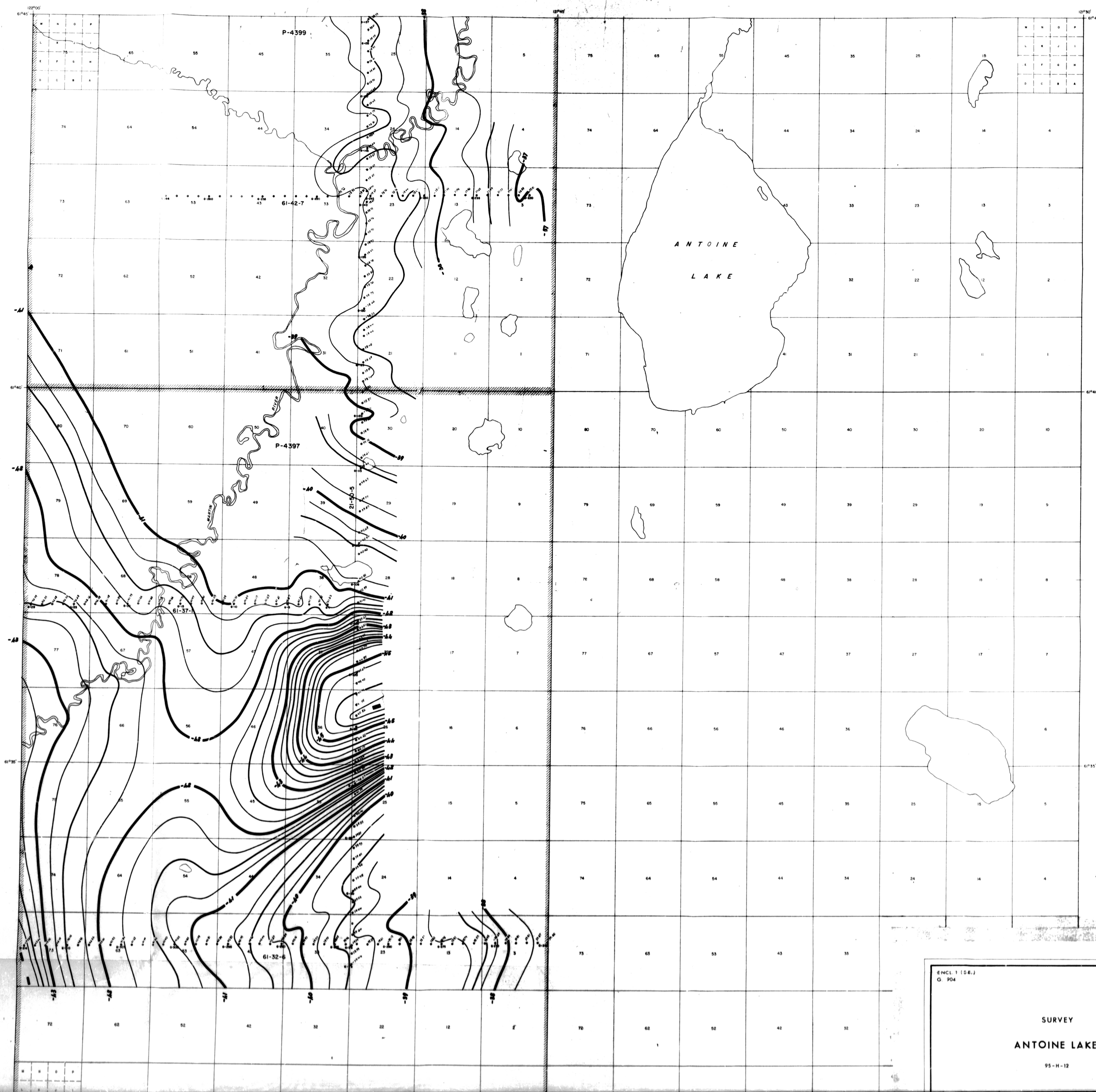
BOUGUER ANOMALY

d = 20

scale : 2 inches = 1 mile

COMPAGNIE GÉNÉRALE DE GÉOPHYSIQUE

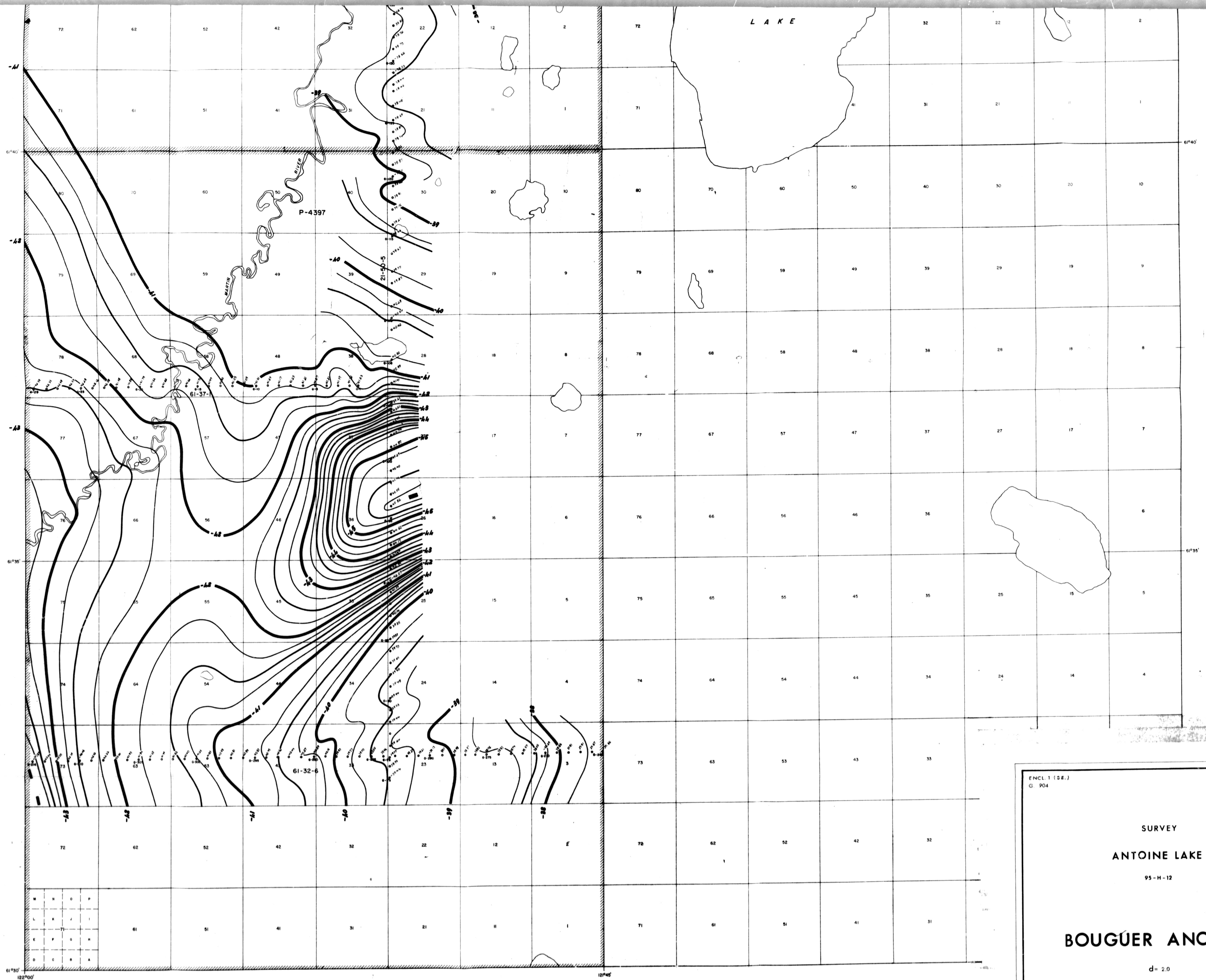
Old map



ENCL. 1 (S.E.)
G. 904

BANFF OIL LTD.

SURVEY
ANTOINE LAKE
95-H-12



ENCL. 1 (S.E.)
G. 904

BANFF OIL LTD.

SURVEY
ANTOINE LAKE
95-H-12

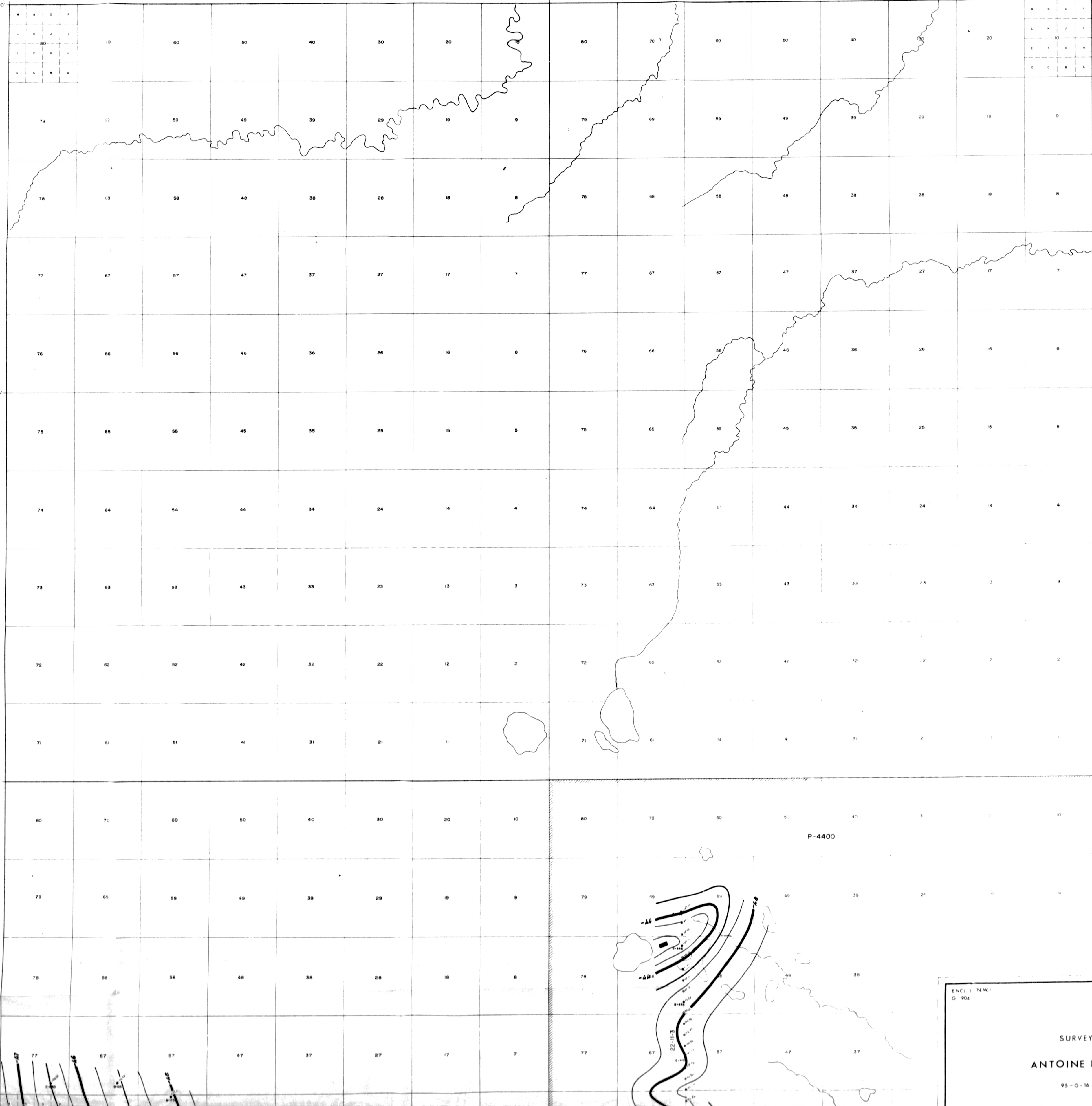
BOUGUÉ ANOMALY

d = 2.0

scale : 2 inches = 1 mile

COMPAGNIE GÉNÉRALE DE GÉOPHYSIQUE

122°30' 122°15' 122°00' 62°00' 61°55' 61°50'

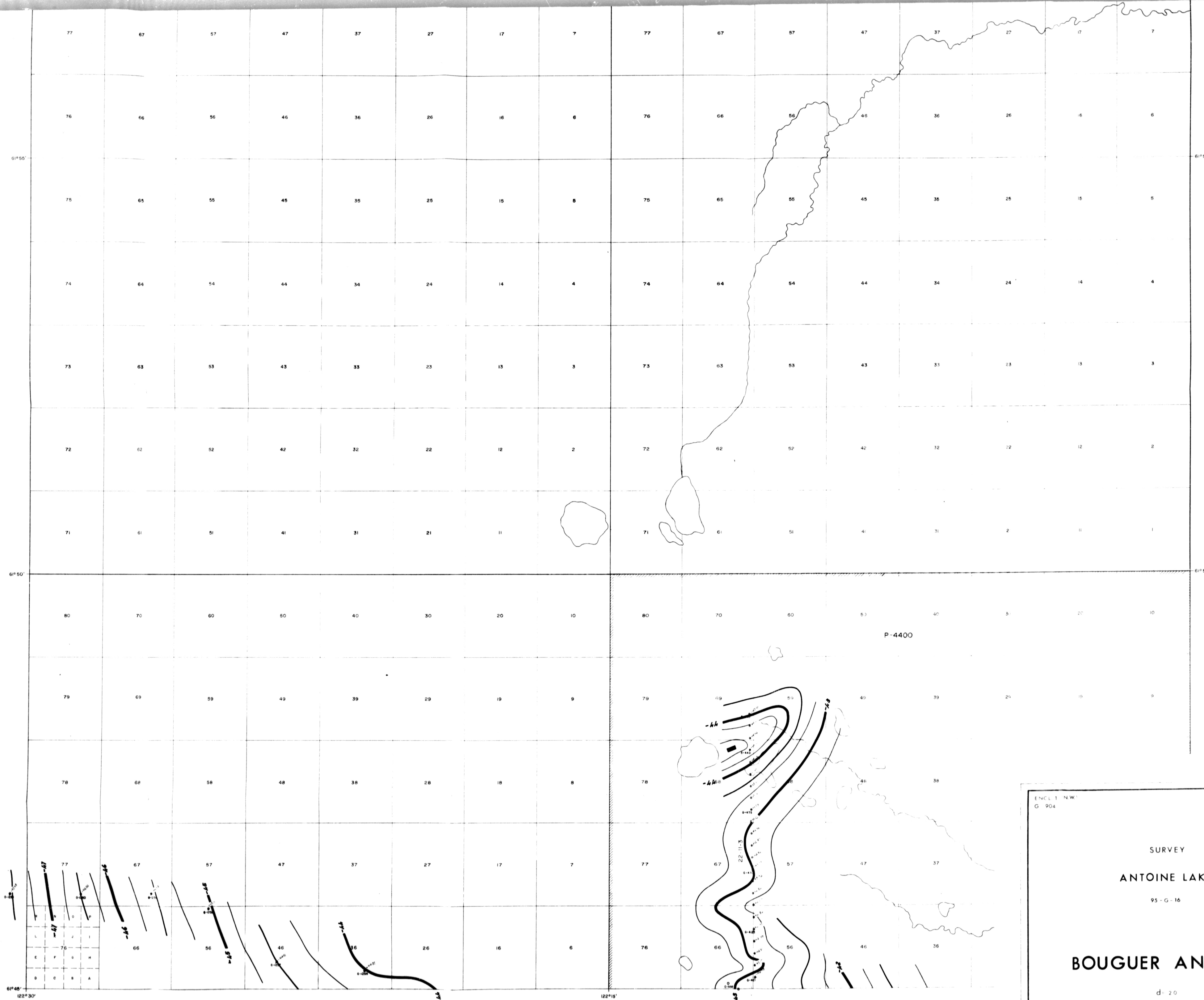


ENCL 1 NW1
G 904

BANFF OIL LTD

SURVEY
ANTOINE LAKE

95 - G - 16



ENCL 1 NW
G 904

SURVEY
ANTOINE LAKE
95 - G - 16

BOUGUER ANOMALY
d- 20

scale : 2 inches = 1 mile

COMPAGNIE GENERALE DE GEOPHYSIQUE

SURVEY
ANTOINE LAKE

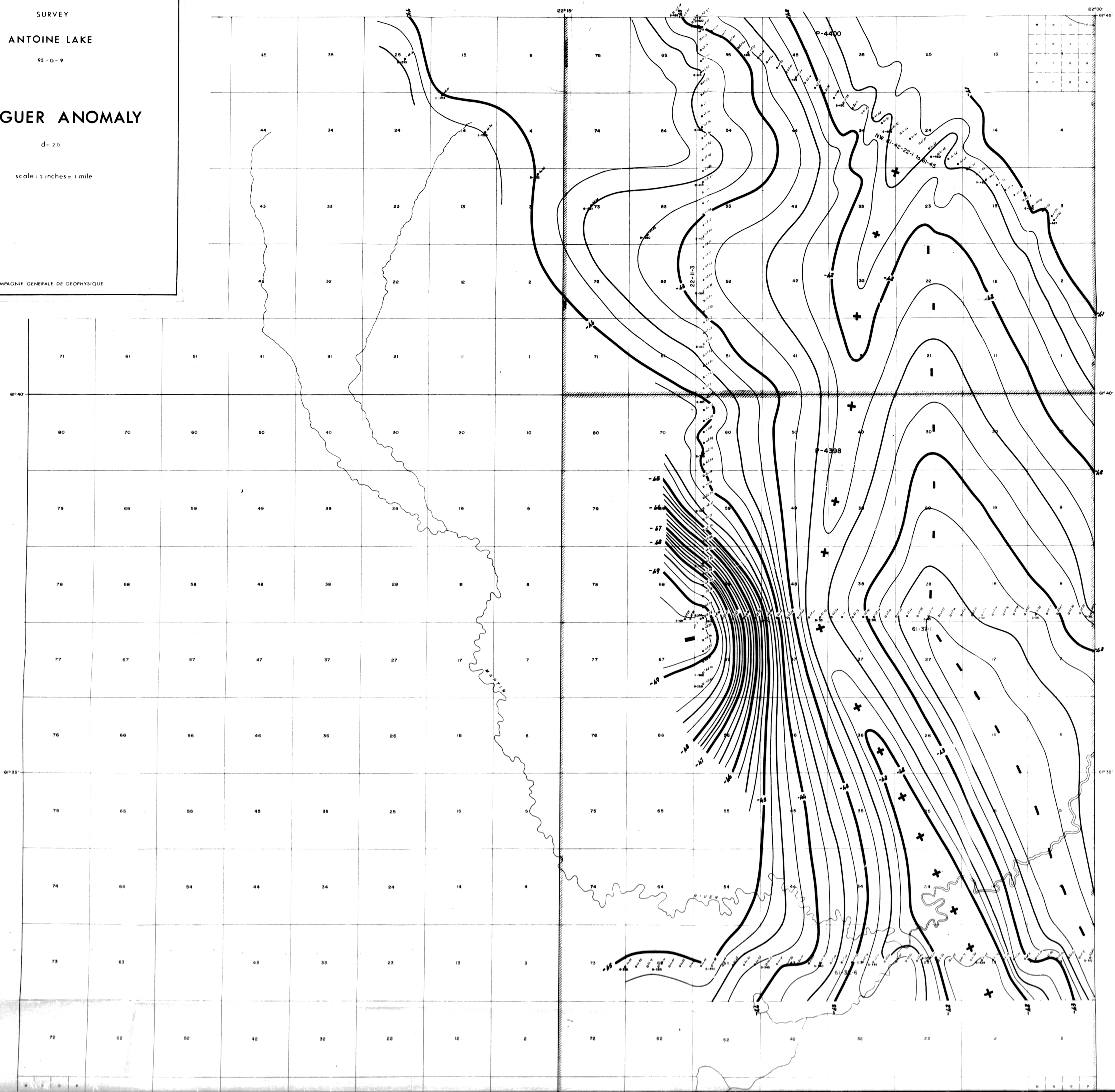
95 - G - 9

BOUGUER ANOMALY

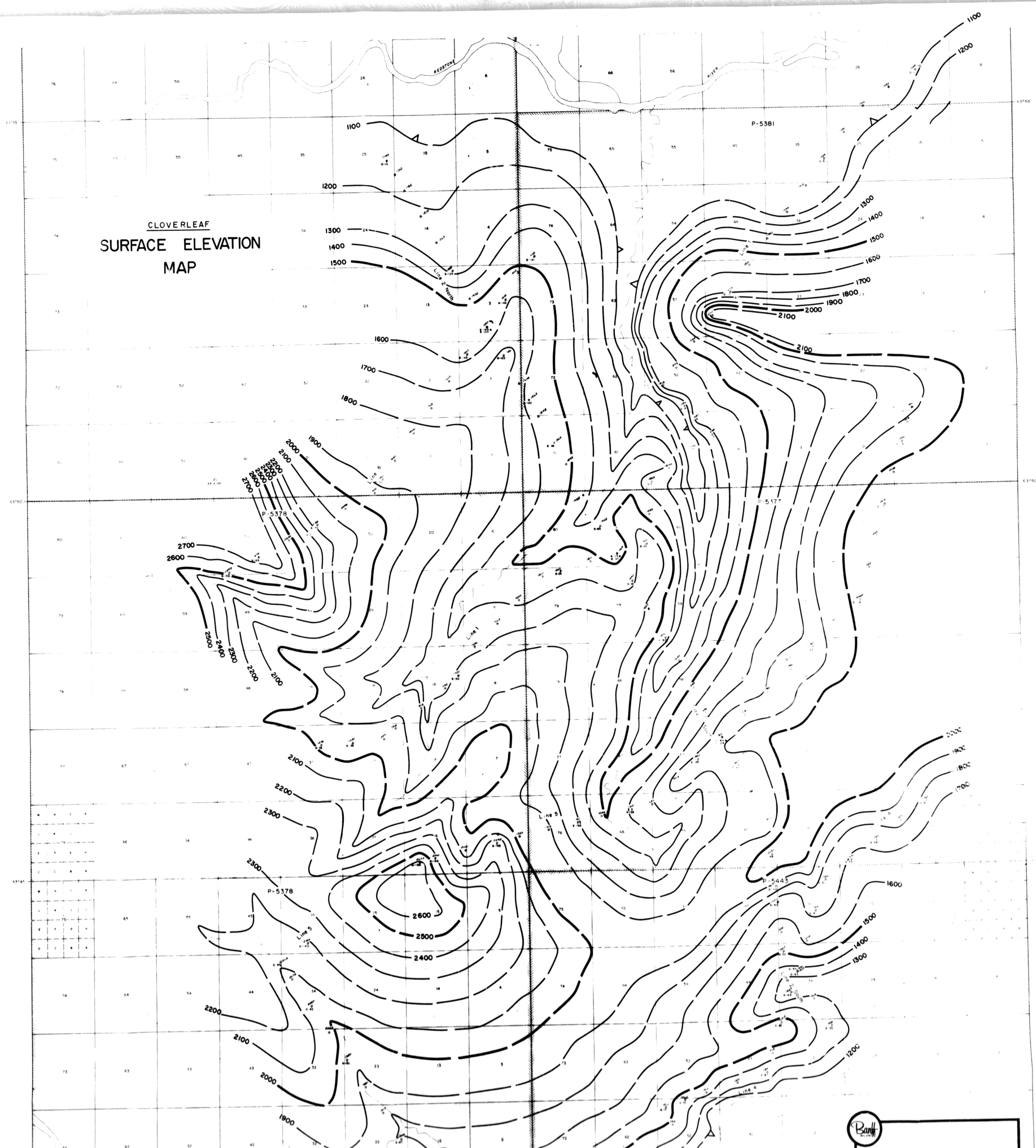
d= 20

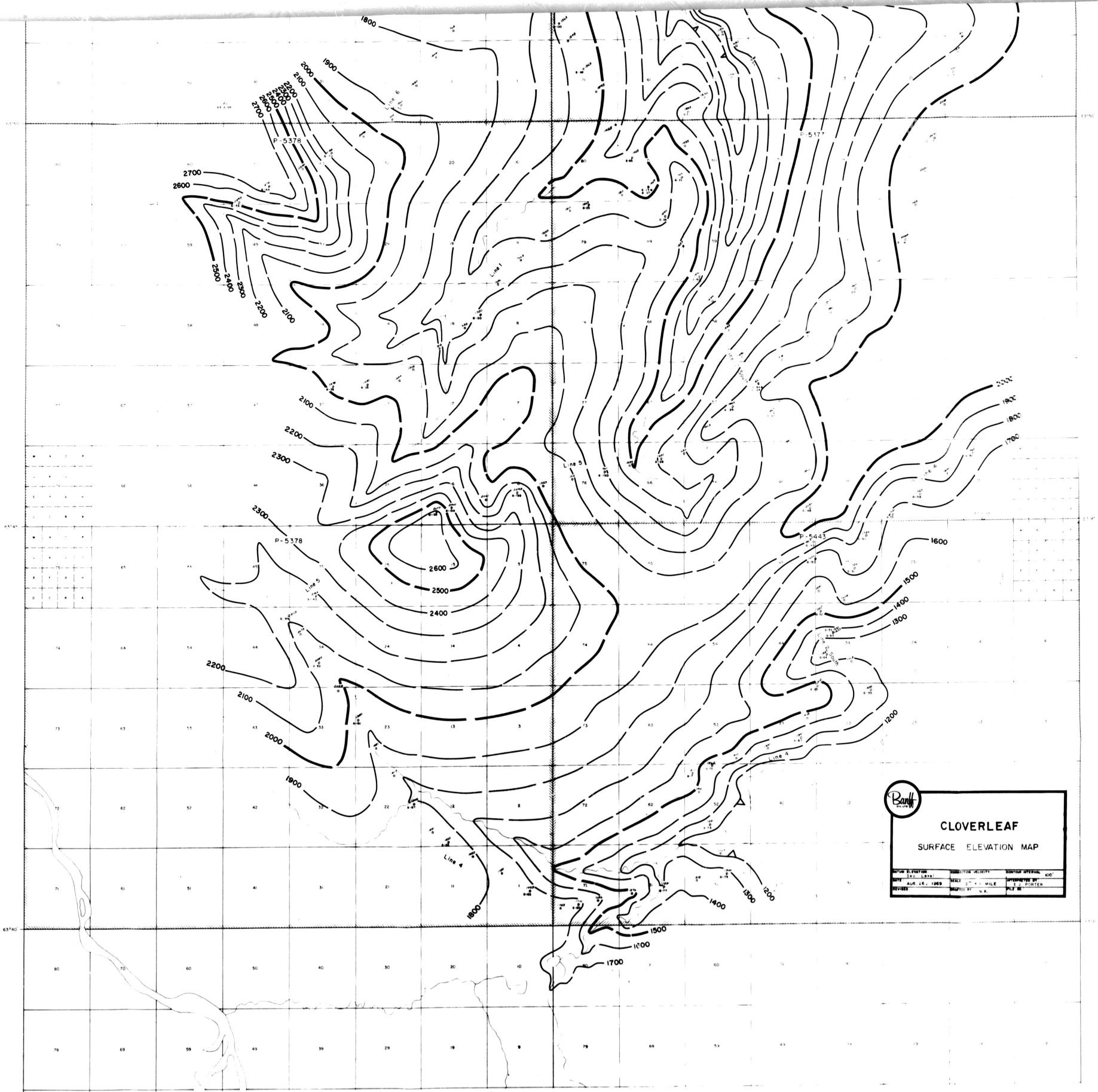
scale : 2 inches = 1 mile

COMPAGNIE GÉNÉRALE DE GÉOPHYSIQUE



CLOVERLEAF
SURFACE ELEVATION
MAP





21
Elev
1000

Sheet
Surface Elev

Edwards

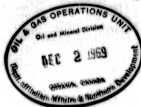
SEISMIC REFLECTION REPORT
CLOVERLEAF AREA
NORTHWEST TERRITORIES

P - 5383, P - 5382, P - 5381, P - 5380
P - 5379, P - 5378, P - 5377, P - 5376
P - 5443

126 6-5-70

A. J. Blashyn

August 26, 1969



SEISMIC REFLECTION REPORT

FOR

CLOVERLEAF AREA

NORTHWEST TERRITORIES

Abstracted for
Geo-Science Data Index

Date _____

Boyle

A. J. Blashyn

AUGUST 26, 1969

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EXPLORATION PROCEDURE	1
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RESULTS, CONCLUSIONS & RECOMMENDATIONS.....	2
STATISTICAL SUMMARY	4

ENCLOSURES:

1. Shotpoint Elevation Map
2. Hume Structure Time
3. Canol - Hume Isochron

INTRODUCTION

The Cloverleaf prospect is located in the Northwest Territories approximately 30 miles west of the junction of the Dahadinni and MacKenzie Rivers. The prospect area lies within the boundaries of Latitudes $63^{\circ} 40'$ and $64^{\circ} 00'$, Longitudes $124^{\circ} 45'$ and $125^{\circ} 45'$. Field operations, conducted by Compagnie Generale de Geophysique, commenced on December 1, 1968 and were completed on January 12, 1969.

EXPLORATION PROCEDURE

The object of the survey was to conduct a seismic reconnaissance program to evaluate the area for structure and reef development. The program consisted of approximately 77 miles of 100% shooting. All data was processed by Banff Oil in structural section form.

OPERATIONS

The late seasonal start of the operation eliminated the possibility of utilizing the MacKenzie River as a transportation medium. Barges were not readily available and icing conditions were progressing. This necessitated the construction of an airstrip to accommodate a move by Pacific Western Airlines Hercules Aircraft.

The airstrip was constructed at a suitable location on the west bank of the MacKenzie River at the Dahadinni River junction. The crew move began on November 12, 1968 with C.G.G., trucking their equipment from Calgary to Hay River. The Hercules was utilized to move bulldozers from Fort St. John, C.G.G. tracked equipment and supplies from Hay River, fuel from Norman Wells and Banff's Porta-built camp from Rainbow Lake. Personnel were flown to Hay River from Calgary via Banff's F-27 aircraft. The personnel were then shuttled to Cloverleaf on the Hercules flights. The entire move to the camp, located

at the intersection of lines 1 and 2, was completed on November 27, 1968.

The program area was located in rough mountainous terrain. Due to severe terrain conditions, track mounted vehicles and temperatures averaging -45°F ; mobility and production was very poor. Basically the shooting parameters consisted of three hole patterns with half mile split spread cables providing 100% subsurface coverage. A detailed resume of the operating parameters are provided in the Operations Summary.

DATA PROCESSING

All structural and data processing corrections were prepared by Integrated Seismic Services personnel, in Banff's offices under the supervision of the Project Geophysicist. Playback facilities were provided by the Banff playback centre.

Structure sections, corrected to a datum of +1800' at a datum velocity of 10500'/s, were prepared on all lines. Effects of the low velocity layer were removed utilizing an uphole-intercept method. The sections were produced as galvo-VAR displays with a filter of 15-20-55-60.

RESULTS, CONCLUSIONS & RECOMMENDATIONS

Reflection identifications were based on the velocity survey at Shell Cloverleaf I-46. The Canol, Hume, Bear Rock and Cambrian reflections were identified and correlated. The Hume reflection, having a coefficient of .33, is the most predominant and the only continuous reflection in the area.

A Hume structure time and a Canol to Hume isochron map were prepared. The continuity on the deeper Cambrian reflection was considered unreliable therefore no deep isochrons were prepared. The interpretation, as shown on the Hume structure map, indicates three significant structural trends striking generally northwest - southeast.

The Sylvan anticline, located in the southwest portion of the prospect, exhibits an anomalous nosing trend in an up-dip position on the northeast flank of the anticline. The lead is positioned on the up-thrown side of a fault which provides additional closure and potential trapping mechanism. The approximate throw across the fault on line 1 is .150 secs or 825' at the Hume level.

The second major trend is the Sylvan syncline lying immediately to the northeast of the anticline and on the down-thrown side of the fault.


The third major trend and second anomalous feature is a horst located up-dip from the syncline. The southwest flank of the horst exhibits approximately .290 secs or 1600' of throw and the northwest flank, .320 secs or 1750' at the Hume level.

The Canol to Hume isochron generally indicates regional thickening to the northeast. A minor thickening trend exists along the axis of the syncline. No reliable evidence of reef development was observed in the Canol to Hume interval or at pre Hume levels.

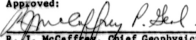
The 77 miles of coverage provides only a loose reconnaissance grid. Before assigning any additional program it is recommended that Banff Oil obtain the Shell data in the eastern portion of the prospect to provide a more complete interpretation for the area. The assigning of any additional programs would be contingent upon the results of the total interpretation.

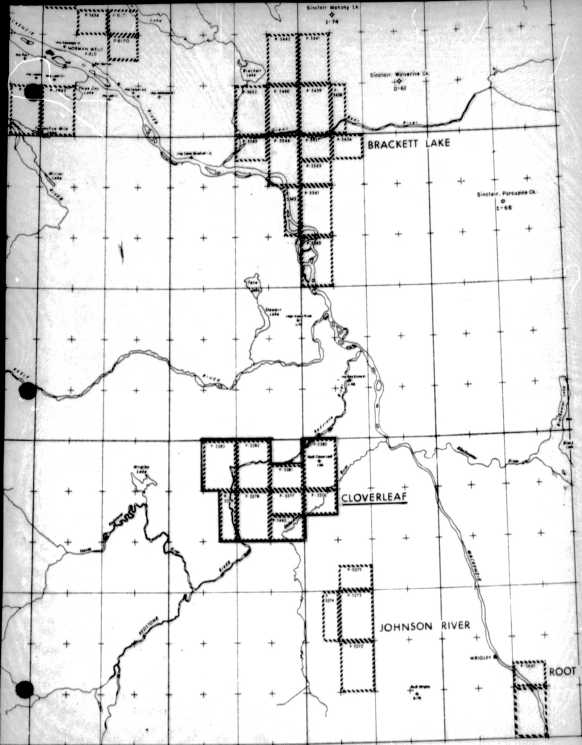
Respectfully submitted,

BANFF OIL LTD.


A. J. Blashyn, P. Eng.
Project Geophysicist

Approved:


R. J. McCaffrey, Chief Geophysicist



BANFF OIL LTD.
GEOPHYSICAL OPERATIONS REPORT

MAP Cloverleaf PERIOD FROM December 1, 1968 TO January 12, 1969
 SHOT BY C.G.C. PARTY S-910
 LOCATION N.W.T. 125° LONG 64° LAT
 OR TWPS. REGS. W M

CAMP SITE LOCATION Junction; Lines 1 and 2

TERRAIN Rough, Mountainous

COMMUNICATIONS S.S.B. Radio Intermittent Reception
Mobile Radios

ACCESS Via Aircraft to Airstrip on Mackenzie River
and then by tracked vehicle.

MARKS A wheeled supply unit from Airstrip would have
assisted operation. Airstrip was located too
far from camp.

CREW BASICS

CAMP Banff Porta-built
 CATERING Foothills - Edmonton
 TYPE OF VEHICLES Track Mounted

SURVEYING

INSTRUMENTS Wilde Theodolite T-O and T-16
 BENCH MARKS Shell Cloverleaf Well I-46

TIES Air Photo Mosaics

ELEVATIONS HIGH +2731 LOW +1024

REMARKS Surveying was slow due to extreme rough terrain, short
daylight hours and cold weather.

BUILDING

CONTRACTOR Borsk Construction - Dawson Creek, B.C.

EQUIPMENT 2-D6, 2-D7, Own camp, 1-Ton supply truck

PRODUCTION Approximately 2 miles per day

REMARKS Equipment and personnel was adequate to provide an
efficient operation.

DRILLING

CONTRACTOR Two-way Drilling - Calgary

EQUIPMENT 2 - Conventinals

1 - Top Drive

3 - Water Trucks

PRODUCTION Approximately 2 hours/SP (180')

Approximately 30 feet/hour/drill

REMARKS Due to poor equipment and personnel the drilling was somewhat less
than adequate. All three drills operated on only three days.
Conventional drills recommended for this area.

K	L	M
x	x	x

SPREAD DIAGRAM

S.P.

PRODUCTION Approximately 2 hours per shot-point

REMARKS Recording production was restricted by poor drill production.

Data quality very poor to fair.

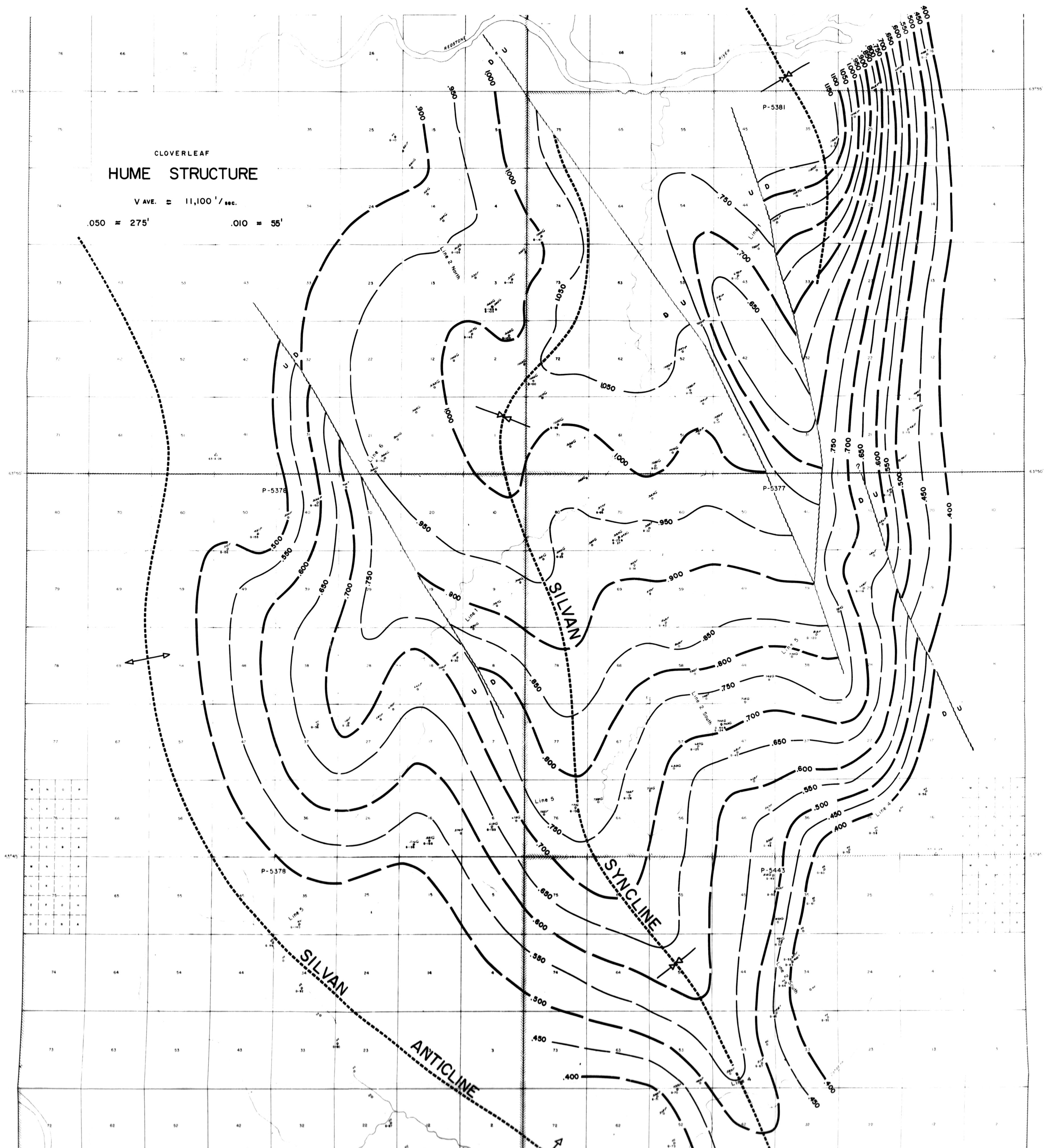
PERSONNEL

SUPERVISOR M.Eidsness
PARTY MANAGER O. Dionne
PARTY CHIEF -
CHIEF COMPUTER -
OBSERVER N.Muscarella
SURVIVOR P.Grisi

INTERPRETATION:

STRATIGRAPHIC CHART

ERA	PERIOD	WRIGLEY - DAHADINNI RIVER	LIARD PLATEAU - TROUT LAKE	NORTHERN ALBERTA	GREAT SLEAVE LAKE
PALEOZOIC	DEVONIAN	<p>UPPER</p> <p>IMPERIAL ss, sh</p> <p>sh & sl</p> <p>CANOL sh</p> <p>HORN RIVER (Horn indur) sh</p> <p>MIDDLE</p> <p>NAHANNI ls</p> <p>HUME ls</p> <p>HEADLESS sh, ls</p> <p>FINCHES ls, sandstone</p> <p>ARKICA ss, sh, sl</p> <p>DELOUM ss, sh, sl</p> <p>LOWER</p>	<p>ROTCHE sh, ls</p> <p>TEYCHO ls, sh</p> <p>TROUT RIVER sh</p> <p>WAKA sh, sl, ss</p> <p>REDNOSE sh</p> <p>BEAVER LAKE sh, ls</p> <p>BESA RIVER sh</p> <p>FORT SIMPSON sh, sl</p> <p>MUSKWA</p> <p>SLAVE PT sh, sl, ss & dol</p> <p>WATT MTN</p> <p>PRESQUE sh, sl, ss</p> <p>PINE POINT coars</p> <p>CHINCHAGA sh, sl, ss & dol</p> <p>RED BEES</p>	<p>WABAMUN</p> <p>WINTERBURN</p> <p>WOODBEND</p> <p>BEAVERHILL LAKE</p> <p>SLAVE POINT</p> <p>WATT MTN</p> <p>MUSKWA</p> <p>STANK WGR</p> <p>ELK RIVER</p> <p>Lower member is</p> <p>CHINCHAGA</p> <p>RED BEES</p> <p>CALEDONIAN EPIEROGENY</p>	<p>ROTCHE sh, ls</p> <p>TEYCHO sh</p> <p>TROUT RIVER ls, sh</p> <p>KARISA ls</p> <p>REDNOSE ss, sh, ls</p> <p>TATLIN sh</p> <p>UPPER MUR ls</p> <p>FALLS</p> <p>ALEXANDRIA ls, sh</p> <p>SEASIDE MTD</p> <p>FORT SIMPSON - HAY RIVER sh</p> <p>MUSKWA sh</p> <p>SLAVE POINT</p> <p>SLAVE PT</p> <p>HORN RIVER</p> <p>FINCHES</p> <p>ARKICA</p> <p>DELOUM</p> <p>LOWER</p> <p>CHINCHAGA</p> <p>RED BEES</p> <p>CALEDONIAN EPIEROGENY</p>
	SILURIAN	<p>WHITTAKER ls</p> <p>MOUNT KINDLE dol, retool</p> <p>FRANKLIN MTD</p>	<p>WHITTAKER</p>	<p>WHITTAKER</p>	<p>CHINCHAGA</p> <p>RED BEES</p> <p>CALEDONIAN EPIEROGENY</p>
	ORDOVICIAN	<p>UPPER</p> <p>MIDDLE</p> <p>LOWER</p>	<p>UPPER</p> <p>MIDDLE</p> <p>LOWER</p>	<p>UPPER</p> <p>MIDDLE</p> <p>LOWER</p>	<p>UPPER</p> <p>MIDDLE</p> <p>LOWER</p>
	CAMBRIAN	<p>SALINE RIVER sh, gyp & salt</p> <p>MOUNT CAP sh</p> <p>MOUNT CLARK ss, quartz</p> <p>ONE LAND sh, sl, slt, tgl & dol</p>	<p>SALINE RIVER sh, gyp & salt</p> <p>MOUNT CAP sh</p> <p>MOUNT CLARK ss, quartz</p> <p>ONE LAND sh, sl, slt, tgl & dol</p>	<p>SALINE RIVER sh, gyp & salt</p> <p>MOUNT CAP sh</p> <p>MOUNT CLARK ss, quartz</p> <p>ONE LAND sh, sl, slt, tgl & dol</p>	<p>SALINE RIVER sh, gyp & salt</p> <p>MOUNT CAP sh</p> <p>MOUNT CLARK ss, quartz</p> <p>ONE LAND sh, sl, slt, tgl & dol</p>
PRECAMBRIAN					

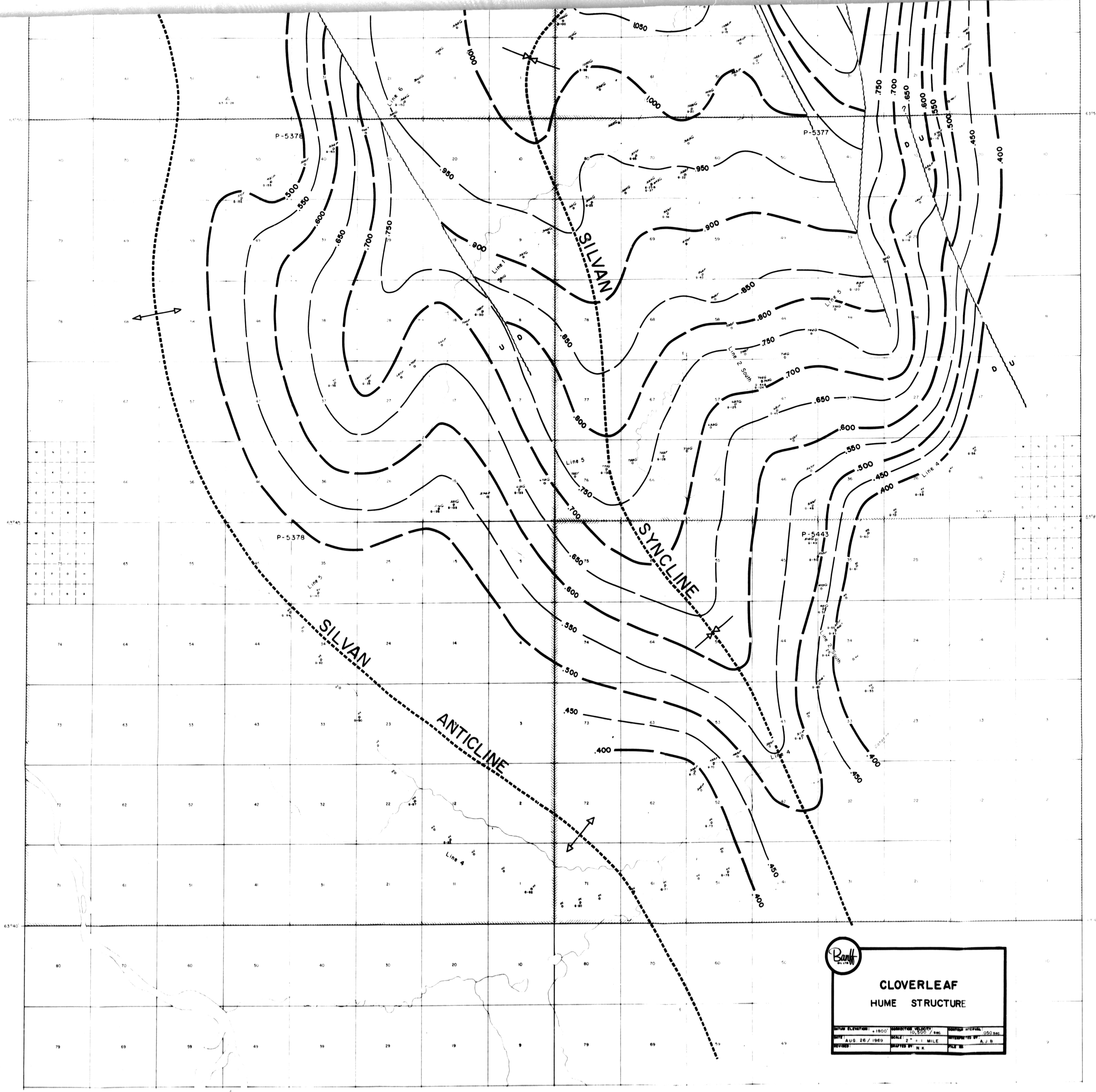


CLOVERLEAF
HUME STRUCTURE

V. AVE. = 11,100' / sec.

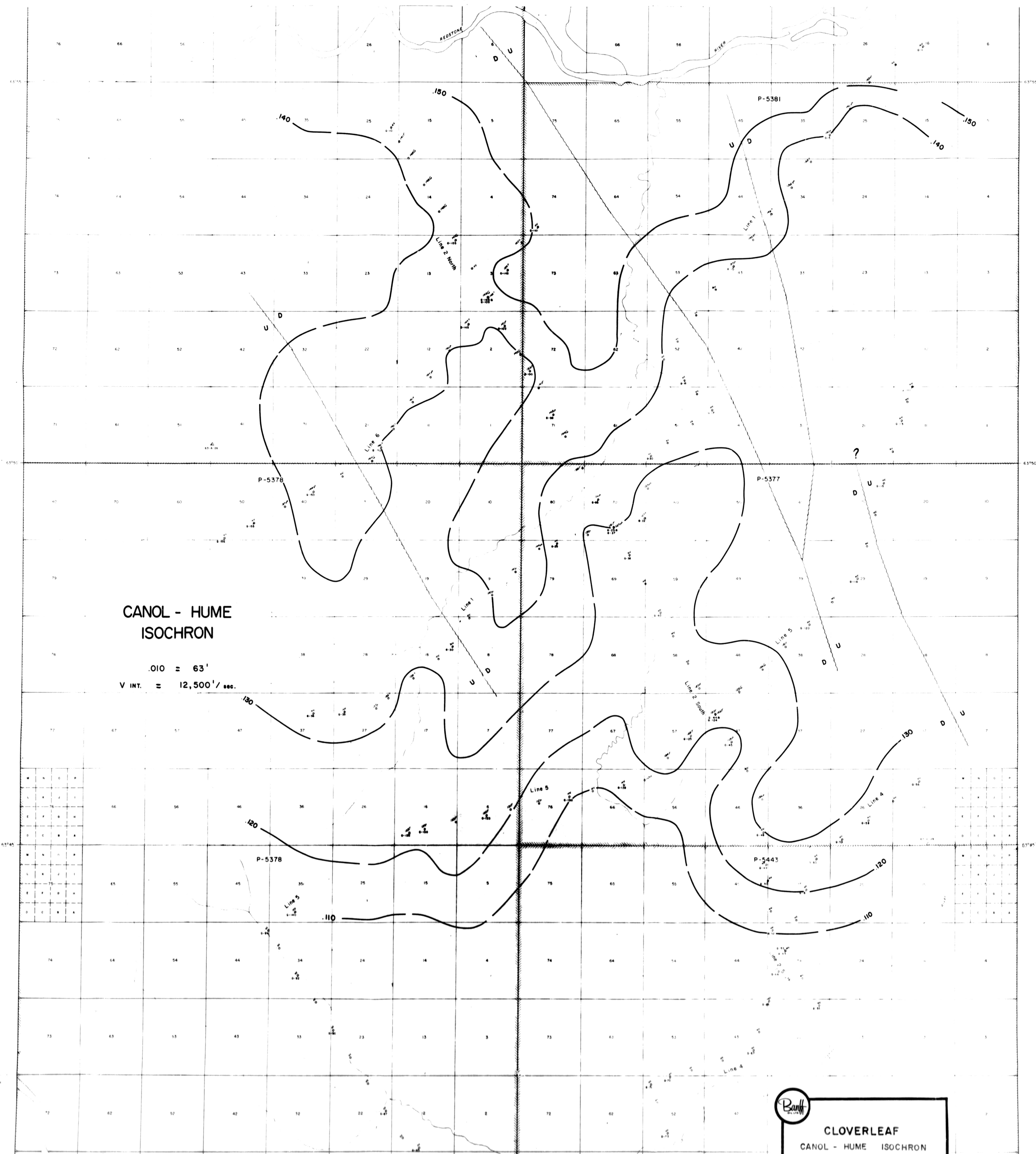
.050 = 275'

.010 = 55'



**CLOVERLEAF
HUME STRUCTURE**

DATE: AUG 26 / 1969	SCALE: 2" = 1 MILE	INTERPRETER: A.J.B.
REVISOR: N.A.	DATE: N.A.	FILE: N.A.



CANOL - HUME
ISOCHRON

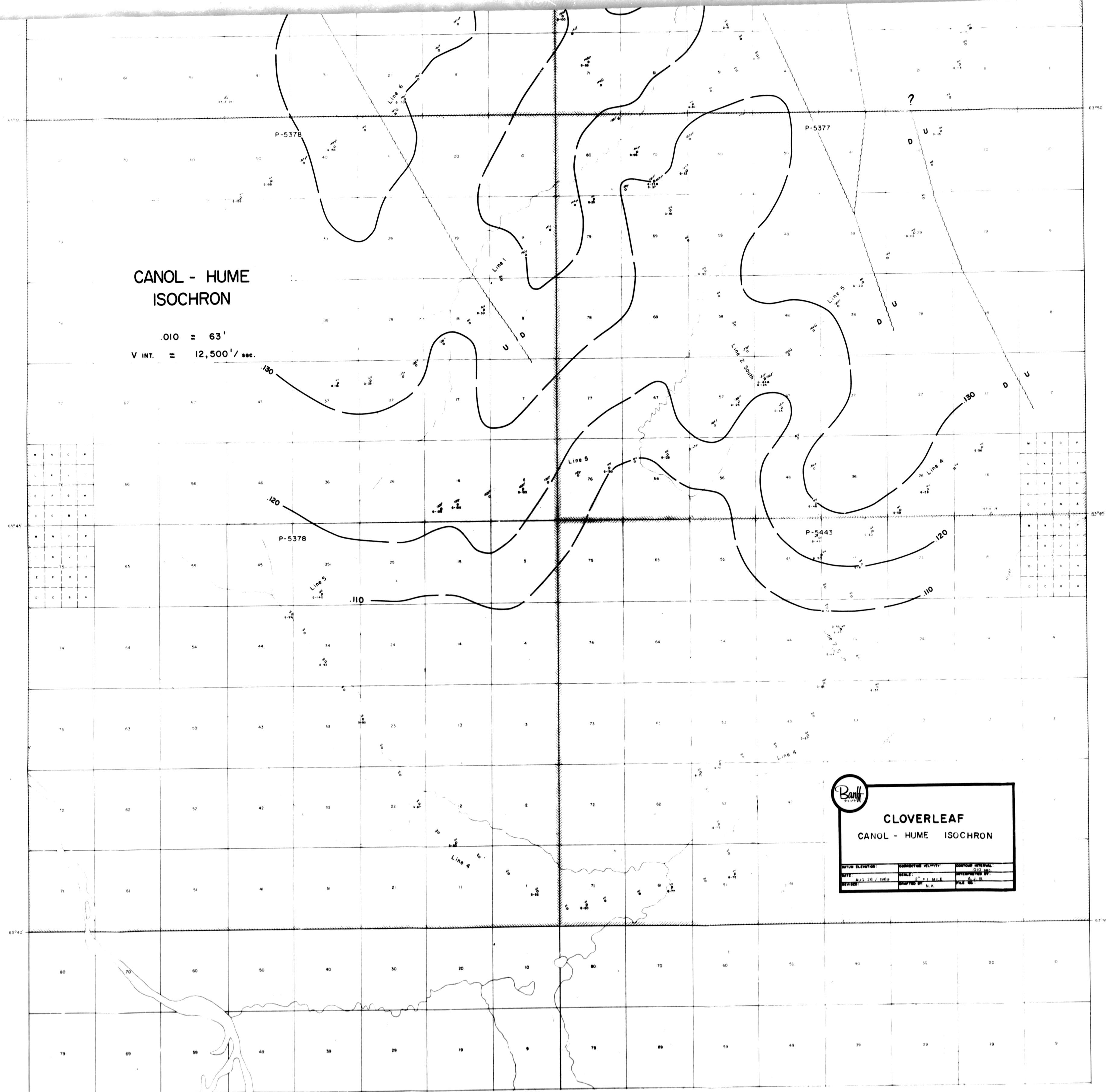
.010 = 63'
V INT. = 12,500' / sec.



CLOVERLEAF
CANOL - HUME ISOCHRON

CANOL - HUME ISOCHRON

.010 = 63'
V INT. = 12,500' / sec.



AJB

Cloverleaf